

**ENVIRONMENTAL ASSESSMENT  
FOR THE  
OPERATIONS, TRAINING, AND TESTING  
OF UNMANNED AERIAL VEHICLES  
AT REDSTONE ARSENAL, ALABAMA**



**DIRECTORATE OF ENVIRONMENT AND SAFETY  
U.S. ARMY GARRISON – REDSTONE  
REDSTONE ARSENAL, ALABAMA**

**MAY 2004**

May 2004

**FINDING OF NO SIGNIFICANT IMPACT (FNSI)  
ENVIRONMENTAL ASSESSMENT FOR THE TRAINING, TESTING, AND  
OPERATION OF UNMANNED AERIAL VEHICLES  
AT REDSTONE ARSENAL, ALABAMA**

The Army proposes to conduct training, testing, and flight operations of unmanned aerial vehicles (UAV) at Redstone Arsenal, Alabama. The environmental analysis addresses two alternatives, the proposed action and the no-action alternative.

**Proposed Action:** The proposed action includes training, testing, and operations of unmanned aerial vehicles at Redstone Arsenal. The location for ground operations is on Test Area 3 and will include the construction of a new UAV Launch/Recovery site and a new building. Test Area 3 was determined to be the most suitable location on the installation that would accommodate the proposed training and testing operations, as well as allowing future expansion of the UAV operations if needed. The maximum potential disturbance area encompasses approximately 30 acres, which includes the construction areas needed for earth-moving activities, the proposed building location, and the tree removal areas. The proposed construction will occur in two phases. The first phase will consist of a 370 foot by 50 foot asphalt runway with 200 foot grassed run-out areas on each end. The second phase will consist of the addition of 930 feet of asphalt runway to the initial runway for a 1,300 foot total length and will occur at a later date. The new building also will be constructed in the future and consists of approximately 30,000 ft<sup>2</sup>.

The proposed action will provide training to U.S. military and Department of Defense (DoD) civilians in support of national security concerns in addition to allowing flight operations and testing of UAVs to be conducted at the installation. Maintenance operations for UAV will be conducted on-site. The new building will be used for administration, vehicle storage, and equipment storage. In the future, the UAV Launch/Recovery site will be used for testing operations of UAV.

The FAA-approved airspace for UAV flight training and testing includes RSA airspace and an area south of the installation up to five nautical miles from the southern installation boundary. UAV flight operations are not allowed over the Huntsville Metropolitan Area. Site locations further north on the installation will not allow the UAVs to remain in RSA airspace during take-off and landing. The training and operations at the RSA airfield would disrupt the normal operation of the airfield. The airfield is not within FAA-approved airspace so flight operations would be halted if the RSA tower is not operating. In addition, priority of use for UAV operations would not be guaranteed.

**No-Action Alternative:** Under the no-action alternative, training and testing activities, as well as the construction of the UAV Launch/Recovery site and the building would not occur at RSA. The current facilities at RSA are inadequate to conduct regular training and testing of UAV. The immediate need for the training of the National Guard units would not be met due to logistical difficulties involved in transfer of the units and equipment to alternate locations.

**Environmental Effects:** Eleven broad environmental components or resources were considered to provide a context for understanding the potential effects of the proposed action and to provide a basis for assessing the significance of potential impacts. The areas of environmental consideration were air quality, health and safety, biological resources, cultural resources, hazardous materials and waste, geology and soils, transportation, infrastructure, land use, noise, socioeconomics, and water resources. Cumulative impacts of the proposed action also were analyzed.

No impacts were identified for land use and socioeconomic components. No significant impacts to the other environmental resources were found and anticipated impacts are mitigable. Best management practices will be used to minimize erosion. Appropriate spill prevention measures, including secondary containment for fuels and vehicle lubricants, drip pans placed under generators and stationary vehicles, and spill mitigation kits will be used during operations. On-site unexploded ordnance support will be required during construction. An accident plan will be developed for operations. Hearing Protection devices will be required for all operators. Hearing Protection Devices will be required for all operators. UAV launches in the direction of Martin Road will be minimized. No significant cumulative impacts were identified under the alternatives.

## **CONCLUSION**

The Directorate of Environment and Safety (DES) has prepared an EA that addresses the proposed action and evaluates the environmental impacts of the alternatives considered. Based on the EA for the training, testing, and flight operations of UAV at Redstone Arsenal, Alabama, May 2004, there would be no significant environmental impacts associated with this project that would require the preparation of an Environmental Impact Statement.

DEPARTMENT OF THE ARMY  
UNITED STATES ARMY GARRISON-REDSTONE  
REDSTONE ARSENAL, ALABAMA

FINDING OF NO SIGNIFICANT IMPACT (FNSI)  
FOR THE OPERATIONS, TRAINING, AND TESTING  
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AT REDSTONE ARSENAL, ALABAMA

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# **TRAINING, TESTING, AND OPERATION OF UNMANNED AERIAL VEHICLES AT REDSTONE ARSENAL**

## **INTRODUCTION**

The National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508), Department of Defense (DoD) Directive 4715.9, *Environmental Planning and Analysis* (U.S. Department of Defense 1996), and 32 CFR Part 651, Army Regulation (AR) 200-2, *Environmental Analysis of Army Actions* (Department of the Army 2002), which implements these laws and regulations, direct DoD and Army officials to consider environmental consequences when authorizing or approving Federal actions. Accordingly, this Environmental Assessment (EA) analyzes potential environmental impacts associated with testing and operation of unmanned aerial vehicles at Redstone Arsenal, Alabama. Activities will include temporary training operations, as well as the construction of the UAV Launch/Recovery site and a new building.

## **PROPOSED ACTION**

### **Purpose and Need**

The purpose of the proposed action is to conduct testing, training, and flight operations of unmanned aerial vehicles (UAV) at Redstone Arsenal (RSA), Alabama. The UAV Launch/Recovery site and a new building will be constructed to accommodate the proposed activities. Activities associated with the proposed action will include temporary training operations as well as intermittent flight operations associated with the testing of UAVs.

The testing and training facilities for UAV at the installation are inadequate. Currently, UAV program management occurs at RSA. An adequate facility at RSA for conduct training and testing operations would alleviate the time delays involved with training military units and testing of vehicles at other locations. Adequate facilities would also allow product development to quickly test new procedures and integration of new systems. A new facility is needed to adequately accommodate the proposed operations of the UAV.

In addition, there is an immediate need to train National Guard units in operation of UAVs in support of national security. The training will be conducted prior to deployment of the units for national security concerns. Training of soldiers on UAV operations is normally conducted at Fort Huachuca, Arizona, but there is a need to conduct the training at a location that satisfies the mobilization orders of the Guard units and efficiently expedites the training. As a result, an alternate location for training is needed to relieve the logistical difficulties of conducting the training at Fort Huachuca. The alternate location for this training has been identified as RSA.

### **Description of the Action**

The proposed activities will involve the use of UAV the size of RQ-7A Shadow 200 UAV and smaller. For analysis purposes, the operational requirements of the Shadow UAV will be described and used in this document.

The RQ-7A Shadow 200 Tactical Unmanned Aerial Vehicle is approximately 11 feet in length, with a 13 foot wingspan and a 330 pound maximum gross launching weight. The Shadow has a wing area of approximately 23 ft<sup>2</sup>, an overall height of 3 feet, and a propeller diameter of 2 feet, 2 inches. Shadow is powered by a 38 horsepower rotary engine and holds 10.5 US gallons of motor or aviation gasoline, which is stored in fire-

retardant, explosion-proof wing cells. The Shadow UAV has a maximum cruising speed of around 94 mph, a stalling speed of 64 mph, a maximum climbing rate of 1,500 feet per minute, and a normal mission range of altitude of 6,000 feet to 14,000 feet. The maximum datalink range for the Shadow is 67 nautical miles and the operational radius is 31 miles (50 km). Maximum flight time varies from 4 to 5 hours. The size and shape of the Shadow UAV make the craft difficult to detect by radar; in addition, the vehicle is not audible beyond 2,000 feet (Life Cycle EA for Shadow 200 Tactical UAV, AMCOM 2002). No weapons, explosive, hazardous materials, or radioactive materials are carried aboard the vehicle. The payload for the UAV varies with mission requirements but generally includes photographic/video equipment, communications equipment, and a variety of sensors including mine detection equipment. The Shadow UAV has received a System Safety Release and Material Fielding Release and a Statement of Air Worthiness (Appendix C).

An air vehicle operator controls the UAV from the Ground Control Station (GCS) by monitoring the flight position through use of a high-resolution digital map. The air vehicle operator conducts the flight through uplink commands to the vehicle and monitors flight parameters. The UAV includes GPS navigation, which can be used to preprogram the entire mission. UAV flight operations usually follow a preprogrammed flight plan but the vehicle can be completely controlled in the GCS to avoid traffic or to accommodate a change in the mission. The take-off and landing are typically automatic, with the take-off accomplished by a hydraulic catapult system and arresting gear and nets used for landing. Take-off and landing typically occur within an area approximately 240 feet by 35 feet, with emergency landings occurring by parachute. The system has a primary and a backup datalink. Two GCSs, a primary system and a backup, can transfer control of the UAV between the stations or assume control of another UAV. The system has a preprogrammed flight plan if the link is lost between the GCS and the UAV in order to allow a re-establishment of the link. If contact is not restored, the UAV remains in a holding pattern until the flight automatically terminates and conducts an emergency landing by use of parachute. The air vehicle operators maintain continuous radio contact with Redstone Air Traffic Control during any flight operations outside of RSA restricted airspace.

The area of UAV flight operations has been approved by the Federal Aviation Administration (FAA) and the Certificate of Authorization is shown in Appendix C. UAV flight operations will occur within RSA airspace, including current installation restricted airspace and areas adjacent to the restricted airspace, and an area to the south of the installation that extends approximately five nautical miles south of the installation boundary (Appendix C). Launch and recovery for UAV flight operations will occur within RSA airspace. Flight operations will be restricted above 2400 feet in RSA non-restricted airspace and restricted to 6,000 feet to 10,000 feet in altitude during operations south of the installation. Prior to each flight, flight plans will be coordinated with Redstone Flight Operations, which will coordinate with Redstone Air Traffic Control. Traffic will be avoided through either continuous monitoring by Redstone Air Traffic Control or through the use of a secondary chase vehicle to avoid traffic by visual observation. The Certificate of Authorization requires that the UAV flight operations be conducted only when the Redstone Air Traffic Control Tower is operational.

The primary use of the Shadow UAV is providing almost real-time video surveillance to Brigade and Battalion Commanders. The surveillance can be used to track high value targets or to provide battlefield information to the commander. This information allows Army command to observe critical elements of the battlefield and maneuver forces to take advantage of situational strengths and weaknesses. The use of unmanned aerial vehicles allows the Army command to obtain information that is critical but difficult to acquire (i.e. observation of the battlefield and high value targets) without the risk required with manned vehicles and operations.

The field system includes a ground crew of 22 persons composed of officers, operators, and maintenance. For flight operations, six High Mobility Multi-Wheeled Vehicles (HMMWV) are used to deploy and transport the system, including the UAVs and the launcher, two GCSs, the equipment, and the crew. The two GCSs are used to operate and monitor the UAV, as well as processing surveillance information from the UAV and

coordinating mission planning. Each GCS has two operators with identical capabilities and functions in order to operate the system in case of failure. The field system is powered by Uninterruptible Power Supply batteries but includes at least one 10 kVA tunnel generator and at least two 2.5 kVA support generators.

The proposed training operations will be conducted approximately two to six times per year for a maximum period of six weeks per training session. Operations during the training could potentially occur 24 hours per day, seven days per week, for several weeks. During this time, at least one UAV would potentially be in the air continuously. The testing operations of UAV will most likely occur infrequently and will probably consist of two to five flights per week for approximately six hours per flight. Testing operations could potentially consist of UAV flights five to six days per week for ten to twelve hours per day. Existing bathroom facilities at adjacent buildings on TA-3 will be used to accommodate the crew during training operations.

Maintenance operations will be performed on the proposed project site. Routine maintenance will occur on an assortment of vehicles including, but not limited to: HMMWV, Shadow UAV, field system portable generators, and other UAVs. Maintenance operations may include: fueling, washing, changing oil, and changing hydraulic fluid. Some basic machine shop operations may be conducted, which may include turning, milling, and sandblasting. Platform integration for sensors, such as infrared, microwave, and laser also may occur on the site.

The proposed building will be approximately 20,000 square feet in size and will be occupied by approximately 35 personnel, consisting of 10 occupants and 25 transients. The facility will provide a support area for meetings, briefings, demonstrations, and light UAV maintenance, as well as providing space for equipment storage, vehicle storage, and general administrative space. Pre-test briefings and testing planning sessions will be conducted in the facility. The new facility also will be used as a staging area for UAV testing and as space for storage of test and test support equipment. Construction will occur at a later date.

The proposed action will involve the construction of the UAV Launch/Recovery site and a building at Test Area 3. Construction will begin as soon as possible, preferably in May 2004. The representative launch/recovery site for the UAV operations is a minimum of 820 feet in length, which includes 100 foot minimum run-out area on both ends of the UAV Launch/Recovery site, and a minimum width of 50 feet (Appendix D). The actual launch and recovery area is approximately 370 feet long by 50 feet wide. The minimum area of total operation, including that needed for the crew, is 820 feet in length by 164 feet wide. The UAV Launch/Recovery site will have a gravel base coated with asphalt to increase the lifespan of the facility. Due to immediate training needs, the minimum launch/recovery site needed to conduct training operations will be constructed initially. For purposes of analysis, the environmental impacts of a 1300 foot long runway will be examined.

## **Alternatives**

Two alternatives have been considered for the proposed project, the proposed action and a no-action alternative.

***Proposed Action.*** The proposed action is to conduct training, testing, and operations of UAVs at Redstone Arsenal. The location for ground operations of the proposed action is on Test Area 3 (Figures 1 and 2). The maximum potential disturbance area will encompass approximately 30 acres (Figure 2), and included the construction areas needed for earth-moving activities, the proposed building location, and the tree removal areas. Maintenance operations that may be conducted will occur within the disturbance area shown on Figure 2. Appendix C, Attachment 2 shows the FAA-approved airspace used for UAV flight training and testing. The proposed project location is of sufficient distance to allow the UAVs to stay in RSA airspace so that the craft do not venture into Huntsville Metropolitan Area airspace during take-off and landing (Appendix C).

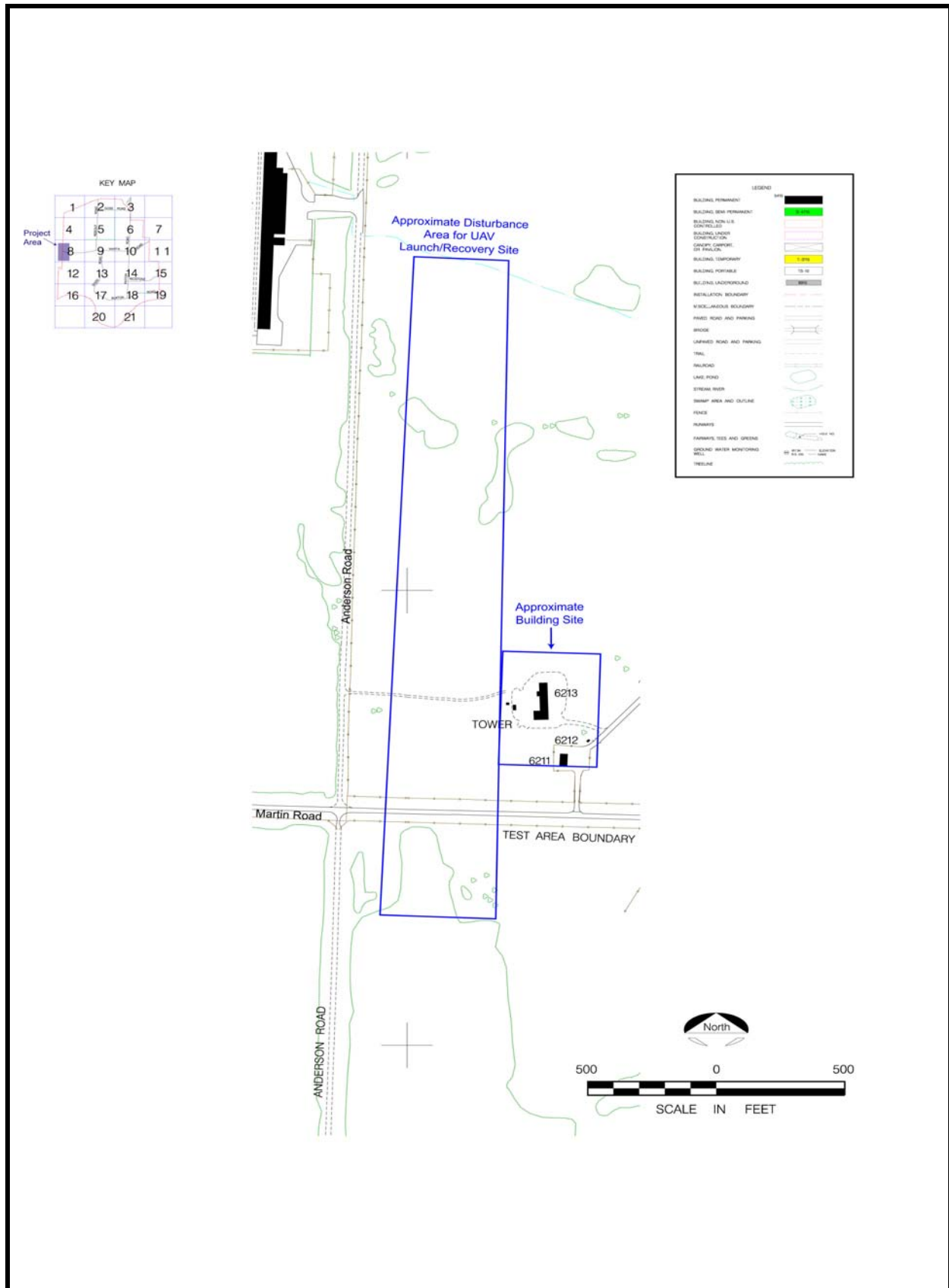


Figure 1. Redstone Arsenal Base Master Plan Map 8 Illustrating the Area of Proposed Action.

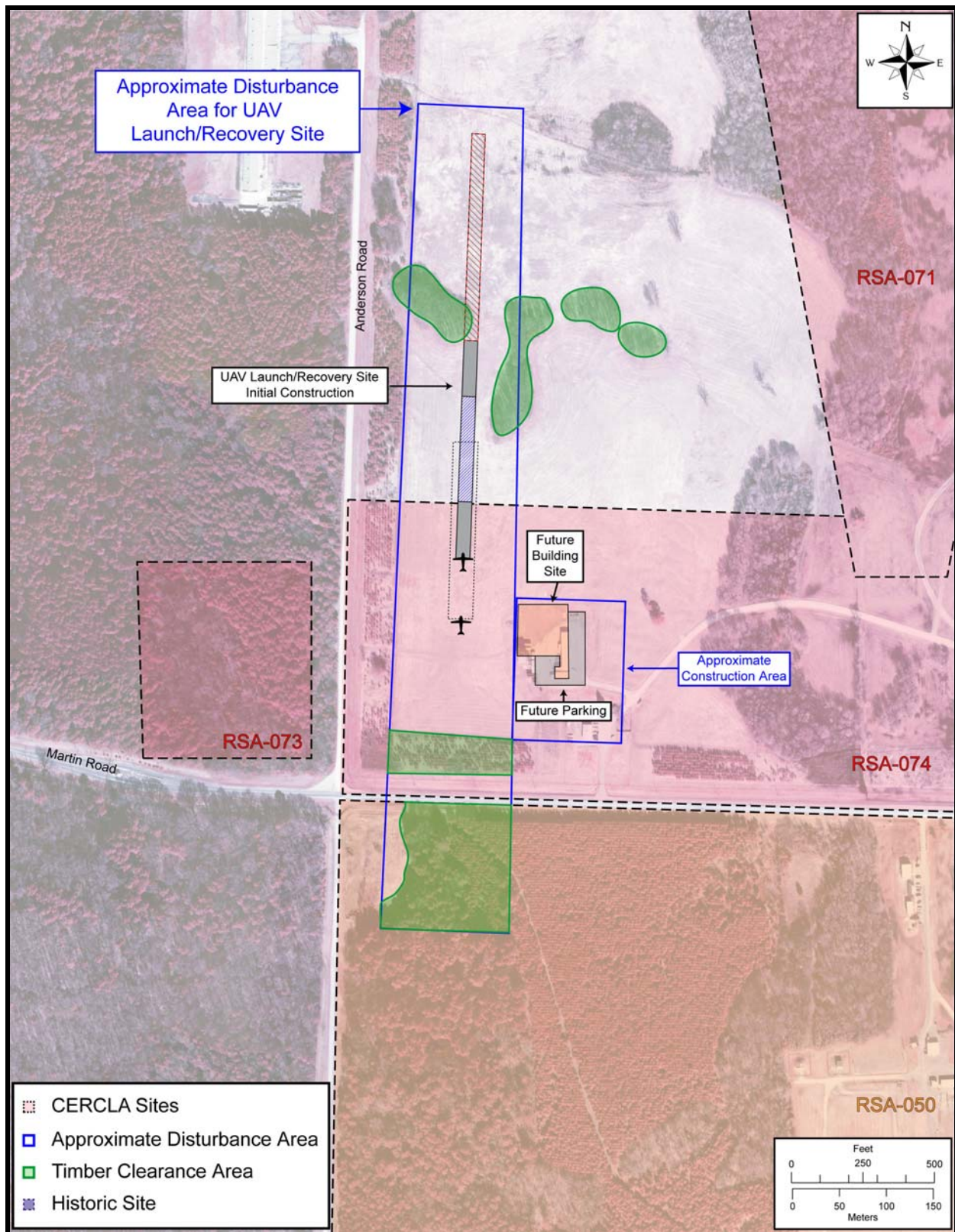


Figure 2. Aerial Photograph Illustrating the Area of Proposed Action.



The proposed construction will occur in two phases. The first phase will consist of a 370 foot long by 50 foot wide asphalt runway with 200 foot grassed run-out areas on each end. The second phase will consist of the addition of 930 feet of asphalt runway to the initial construction for a 1300 foot total length. For purposes of analysis, the environmental impacts of a 1300 foot Launch/Recovery site are examined. The 1300 foot launch/recovery site does not include tree clearance to the north of the facility. If the tree clearance is needed for UAV operations, then another EA will be required.

**No-Action Alternative.** Under the no-action alternative, training and testing activities would not occur at RSA and the UAV Launch/Recovery site and building would not be constructed. No changes, and thus, no impacts would occur, but the need for the testing and training activities would not be satisfied. The current facilities at RSA are inadequate to conduct regular training and testing of UAVs and, without the construction of the UAV Launch/Recovery site and building, the installation could not accommodate the activities. The immediate need for the training of the National Guard units would not be met due to logistical difficulties involved in transfer of the units and equipment to alternate locations. Areas further north on the installation will not allow the UAVs to remain in RSA airspace during take-off and landing. The training and operations of UAVs at the existing RSA airfield would disrupt the normal operation of the airfield. The airfield is not within FAA-approved airspace so flight operations would be halted if the RSA tower is not operating. In addition, priority of use for UAV operations would not be guaranteed.

## **AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

The areas of environmental consideration are air quality, health and safety, biological resources, cultural resources, hazardous materials and waste, geology and soils, transportation, infrastructure, land use, noise, socioeconomics, and water resources.

The assessment of potential environmental impacts and the determination of their significance are based on the requirements in 40 CFR 1508.27. Impacts are evaluated at three levels: (1) No impact—no impact is predicted; (2) No significant impact—impact is predicted, but the impact does not meet the intensity/context significance criteria for the specific resource; and (3) significant impact—an impact that meets the intensity/context significance criteria for the specific resource is expected. Analysis of impact significance is determined using compliance standards or by using best professional judgement.

Thresholds for determining impact significance are based on the applicable compliance standard. When feasible, these criteria correspond to Federal- or state-recognized criteria and are determined using the associated standardized methods. In the absence of compliance standards, the thresholds are based upon a Federal- or state-recommended guidance or follow professional standards/best professional judgment. The criteria and associated thresholds, which have been tailored to the environmental conditions at RSA, are presented in Appendix C.

### **Air Quality**

Under the CAA, Federal actions must not cause or contribute to any new violation of air quality standards, increase the frequency or severity of any existing violation, or delay the timely attainment of any air quality standard or interim milestone.

Redstone Arsenal is located in Madison County, which has an attainment designation for all primary and secondary pollutant standards stipulated under the NAAQS, based on monitoring by the City of Huntsville Department of Natural Resources. Madison County and the City of Huntsville, along with Limestone County, compose the Huntsville Metropolitan Statistical Area (MSA). In 1997, the EPA revised the ozone standard



from a 1-hour standard to an 8-hour standard. The Huntsville MSA and RSA are in attainment for all Federal air quality standards.

The State of Alabama Department of Environmental Management (ADEM) issues air permits for RSA. RSA has a Title V Air Permit (Permit #7090007) issued July 7, 2003 by ADEM that allows RSA to regulate all emission sources under one permit. The permit does not impose maximum emission limits since there are no major air emission sources on RSA.

Potential sources of air emissions associated with the proposed action include the operation and use of the HMMWVs, the operation and use of the UAVs, and the portable generators used as system backup. Air emissions of concern from mobile sources typically occur as a result of a large number of stationary sources in operation for a long period of time. The HMMWVs, a mobile source of air emissions, will have no significant impact on air quality since few vehicles will be used at infrequent intervals. The UAVs, another mobile source, also will have no significant impact due to the few vehicles that will be used and a limited amount of stationary operational time. Flight operations of the UAV should have no significant impact on air quality. The portable generators should have no significant impact to air quality since the generators are small and rarely operated. Due to the size of the generators, a permit would not be required from ADEM. Since the Huntsville MSA is in attainment status, the proposed training and testing operations would not have a significant impact on air quality.

Construction-related air quality impacts may result from fugitive dust (particulate matter) and construction equipment emissions. Emissions can be associated with land clearing, drilling and blasting, ground excavation, and cut and fill operations. Fugitive dust and particulate emissions will be generated during construction activities. Dust emissions vary with level of activity, the specific operation, and prevailing meteorological conditions. Combustion emissions will be generated during construction by heavy construction vehicles and equipment and by vehicular traffic during the operations of the facility. However, emissions will be below the regulated amounts for clean air standards (Appendix D). Because the Huntsville MSA is an attainment area for all federally regulated pollutants, the proposed construction activities would not have a significant impact on the area air quality. Contractors would be required to implement and follow construction best management practices (BMP) and ensure that construction vehicles contain standard vehicle emissions control devices. Fugitive dust from ground-disturbing activities could be reduced up to 50 percent by regular site-watering practices as necessary.

## **Health and Safety**

The standards applicable to the evaluation of health and safety effects differ for workers and the public. OSHA (29 CFR) is responsible for protecting worker health and safety in non-military workplaces. For Army operations, Army Materiel Command Regulation (AMCR) 385-100, *Safety Manual*, establishes the basis for worker safety programs. Protection of public health and safety is an EPA responsibility (40 CFR). Additional safety responsibilities are placed on the DOT (for transportation issues [49 CFR]), the DoD, and the Department of the Army (program requirements established in AMCR 385-100). Safety protocols during operation are identified in the Standard Operating Procedures for proposed action and will be followed accordingly. No significant impacts to health and safety are anticipated as a result of the proposed project.

Health and safety impacts could occur due to construction activities at the site of the Preferred Alternative. Implementation of established safety procedures and Site Specific Health and Safety Plans would minimize potential impacts to health and safety from proposed activities. Governing safety regulations including AMCR 385-100, *Safety Manual*, and all appropriate OSHA regulations including 29 CFR Part 1926, *Safety and Health Regulations for Construction*, would be adhered to during the course of all construction activities. The selected building contractor would comply with all applicable Federal, state, and local laws and regulations.

Based on information from the Installation Restoration Division of the Directorate of Environment and Safety at RSA, a portion of the project lies within the identified safety fan of a former range, and ordnance/explosives are potentially present in the area. As a result, unexploded ordnance (UXO) site support will be required. At least one UXO safety specialist will remain on-site during all earth-moving activities to limit potential exposures to UXO and ensure all applicable U.S. Army Explosive Safety guidance is followed.

A Safety Assessment conducted for the Shadow UAV indicated no limiting factors for operation. A letter from the U.S. Army Developmental Test Command (Appendix E) concludes that the Shadow UAV is considered safe for operation, training, and fielding, but some safety requirements are needed. A concern of the UPS battery venting into the ground shelter was recognized and would be corrected by incorporating outside air vents into the shelter. Accidental starting of the UAV was reduced by labeling the control and adding warnings to the manual. Residual noise levels from the operation of the UAV and the generators were mitigated by requiring hearing protection devices (HPD) for all crew within distances of approximately 204 feet, double HPD within distances of approximately 42 feet, and requiring double HPD with limited time exposure within 29 feet. Potential health and safety hazards have been identified and mitigated to insignificant levels.

An additional concern includes traffic on Martin Road. The site was shifted to the north to minimize any potential risks associated with the roadway. UAV launches will be minimized in the direction of Martin Road. Traffic may need a warning or stoppage of traffic may be necessary if the wind conditions require a launch directly over the roadway. The flight operations for training and testing of UAV at the proposed location should be of a sufficient distance away from Martin Road to have no significant impact to health and safety.

Another concern involved the risk of an accident. The highest potential risk of crash is during launch and recovery. In the event of an accident, the UAVs carry a small amount of fuel, the planes are small, and flights occur over areas of relatively low population density. Hazardous materials associated with UAVs include petroleum, oil, lubricants, lead for balancing weights, and lead acid from batteries (AMCOM 2002). The potential occurrence of an accident is highly unlikely but an accident plan has been developed as a precautionary measure and will be followed in such an event. This concern will have no significant impact on health and safety.

## **Biological Resources**

The vegetation in the project area consists primarily of lawn-type grasses that are maintained by Test Area 3 and the installation. The project area contains an even-aged pine stand, located on the north of Martin Road, with an average diameter at breast height (DBH) of four inches. This stand (approximately 1.5 acres) acts as a buffer for Test Area 3 and will remain as long as the height of the stand does not interfere with launch operations. South of Martin Road, approximately 3.4 acres of immature even-aged pine stand (10 inch average DBH) and mixed pine/hardwood, which includes some mature loblolly pine with an average DBH of 24 inches, will be removed. Two small stand of hardwoods are located on TA-3 in the proposed project area (approximately 2.1 acres). The stands are composed of mixed oak species, with an average DBH of 16 inches with some individuals up to about 20 inches DBH. The trees will be removed to accommodate the take-off and landings of the UAV. Tree removal will be coordinated with the Installation Forrester in order to determine if the trees are marketable value and make arrangements for logging activities if necessary. The only trees that will be removed are those in the immediate project vicinity which includes the area needed for take-off and landing of UAV.

Although no wildlife was observed in the proposed project location, a complete list of wildlife for the installation is available (Godwin and Hilton 1995). Based on the RSA wetland inventory report and a site survey, no wetlands are present on the site or immediately adjacent to the proposed project location (USFWS 2002). The proposed project is not located within the 100-year floodplain as shown in the Redstone Arsenal

*Master Plan Land Use Analysis* (Feb. 1999). The area does not support any unique habitats. The overall site is relatively low in habitat quality as indicated by the dominant vegetation (lawn-type grasses). No significant impacts to biological resources will result from the proposed action.

***Threatened and Endangered Species.*** There are no Federally listed species within or immediately adjacent to the project location, therefore, no significant impacts to Threatened and Endangered Species will result from the proposed action. The proposed project is, however, located within the groundwater protection area for the Federally Endangered Alabama Cave Shrimp. Although impacts to the Alabama Cave Shrimp and the protected habitat are not anticipated, measures would be taken to prevent any discharges into groundwater or surface water. During construction, routine maintenance such as oil changes would not be conducted on-site and no hazardous waste/materials would be dumped on-site. A spill plan and appropriate spill measures would be developed and used during testing and training. Appropriate spill prevention measures would include secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit would be present on site during training and testing operations. No pesticides, herbicides, or saline solutions will be used in the project area. No new septic tanks will be placed in the area; the new building will tie into the existing sewer line at TA-3. The tree removal will have no significant impacts on the Alabama Cave Shrimp.

## **Cultural Resources**

***Historic Structures.*** No standing structures are present in the area of the proposed action.

***Archaeological Resources.*** The area for proposed action has undergone a Phase I archaeological survey (Alexander et al. 2000). One site that is recommended eligible for the National Register of Historic Places (NRHP) is within close proximity to the project area. Site 1MA483 borders the project area on the southwest. This site must be avoided, and a 50 foot buffer from the site must be maintained.

Federal cultural resource preservation statutes mandate that should cultural materials become apparent during construction activities, such materials will be identified and evaluated. Should human remains be encountered, Federal statutes specify that work will cease immediately and the proper authorities be notified (*Federal Register, Rules and Regulations*, Dec. 4, 1995, Vol. 60, No. 232:62161, §10.5). The Alabama Criminal Code (1995 edition, p. 387, §13A-7-23.1) states that any person who willfully removes or desecrates human remains, including American Indian burials and funerary objects, will be guilty of a Class C felony. The proposed action will have no impact on cultural resources.

## **Hazardous Materials and Waste**

The proposed project has two areas that have been identified as former ranges and, therefore, may contain UXO (Figure 2). One is an area located north of Martin Road on Test Area 3. UXO on-site support will be required during construction. No chemical weapons were used in the project area and chemical contamination is not anticipated. UXO on-site support will not be required in the area south of Martin Road since only tree clearance will occur and with no subsurface disturbance. Tree stumps will be left in place. An environmental site work plan evaluation checklist has been prepared for the project (Appendix F).

***Hazardous Materials.*** Several Federal agencies oversee various aspects of hazardous material usage. The DOT regulates the safe packaging and transporting of hazardous materials, as specified in 49 CFR Parts 171 through 180 and Part 397. OSHA regulates the safe use of hazardous materials in the workplace in 29 CFR, primarily Part 1910. EPA regulations are found in 40 CFR. No underground storage tanks, landfills, pesticide/herbicide storage areas, or radioactive materials storage are/will be used during the proposed action. Some fuel storage will likely occur on-site. Some routine vehicle maintenance will occur on-site during training and testing. A spill plan will be developed for the site and measures will be taken to prevent

discharges to groundwater. Appropriate spill prevention measures would include secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit would be present on site during training and testing operations. On-site vehicle maintenance will not occur during construction. The project area has been identified as having potential to contain UXO, therefore, on-site UXO support will be required during construction.

**Hazardous Waste.** Waste materials are defined in 40 CFR 261.2 as “any discarded material (i.e., abandoned, recycled, or ‘inherently waste-like’)” that is not specifically excluded. This can include materials that are both solid and liquid (but containerized). Hazardous waste is further defined in 40 CFR 261.3 as any solid waste not specifically excluded that meets specific concentrations or has certain toxicity, ignitability, corrosiveness, or reactivity characteristics. Oversight of hazardous waste issues is provided primarily by the EPA (as mandated by the Resource Conservation and Recovery Act [RCRA] and the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] and its extension, the Superfund Amendments and Reauthorization Act.) Waste materials generated from UAV activities (on the launch/recovery site and in the new building) at the installation will be handled through existing procedures maximizing recycling where possible.

Any hazardous materials/waste generated from construction would be identified, removed from the site, and disposed of in accordance with current regulations. Construction contractors would have the option of disposing of all construction-related debris on or off RSA. Impacts from hazardous materials and waste from construction activities would not be significant since disposal of all debris and waste would be completed in compliance with current regulations. Hazardous materials, such as lubricants, coatings, and fuels, would be used during construction activities, as well as during the testing and training of UAVs. In order to prevent spill, secondary containment would be used for stored fuel. During re-fueling, drip pans would be placed under generators and stationary vehicles, and a spill mitigation kit would be kept on-site. Any hazardous materials would be disposed of off-site in proper accordance with all Federal and State laws and will be coordinated through the Installation Compliance Division of the Directorate of Environment and Safety (DES). No pesticides (herbicides, rodenticides, insecticides, etc.) would be applied to the proposed project location. The proposed project has two areas that have been identified as former ranges and could potentially contain UXO. On-site UXO support will be required for subsurface work. Any UXO found during construction and site tree clearance will be disposed according to all Federal and state laws.

No significant impact on hazardous materials and waste will occur as a result of the proposed training, testing, and operation of UAV at Redstone Arsenal.

## **Geology and Soils**

Tuscumbia Limestone is the underlying geologic formation of the proposed project area and for most of the installation. One characteristic of the formation is the cavities that form by the dissolution of the primary material, which is limestone. These cavities could lead to the formation of depressions and sinkholes in the project area. There are numerous caves scattered throughout the installation, but there are no known caves on the proposed project area. The unconsolidated surface material of the formation averages around 40 feet deep, but depth can vary from 20 feet to 80 feet (MICOM 1994).

The general soil association for the proposed project location is the Decatur-Cumberland-Abernathy association. This association is described as having generally well-drained, thick soils that occur on level to gently rolling terrain. Three soil units are found in the proposed project area: Decatur silty clay loam, Paleudults, and Emory silt loam. All three of these soil units are described as well-drained. No hydric soils occur in these soil units or are present in the proposed project location. Both Decatur silty clay loam and Emory silt loam are described as prime farmland, but these soils are not protected under the Farmland Protection Policy Act since Federal lands are excluded from consideration (Clendenon 2002; MICOM 1994).

No significant impacts to geology and soils are anticipated as a result of the proposed project. The use of BMPs for erosion control, topsoil management, and re-vegetation is required. During construction, preventive measures for erosion control will include the use of silt fences. Denuded areas will be re-vegetated with grasses as quickly as possible as another preventive measure. The selected contractor will determine the site-specific geotechnical conditions. A NPDES permit will be required from ADEM due to the close proximity to Indian Creek and the fact that the disturbance area is greater than one acre. If the actual disturbance is less than one acre, then a NPDES permit may not be required. No significant impacts to geology and soils are anticipated as a result of training, testing, and operation of UAVs in the proposed project location.

## **Transportation**

Transportation addresses the various modes of transportation that provide access to and circulation within RSA. Essentially, there are no railroad or marine facilities present on RSA. There is an airfield on the installation and helipads in various areas on the base, but they are not generally used as transportation centers. The installation has a well-developed network of roads.

Martin Road, a two-lane highway, is the nearest main road to the location of the proposed project. The closest point of entry to the installation is Gate 7, which is located approximately 0.75 miles from the proposed project location. Approximately 8,000 vehicles travel through Gate 7 daily (MICOM 1994), but this number likely has increased. Another road in the vicinity is Anderson Road, which is primarily gravel and runs north to south on the western boundary of TA-3. Direct access to the proposed project area is generally limited.

No significant transportation impacts are anticipated during the construction activities associated with the new UAV operations at the proposed project location. Interruptions to the roadway system outside the proposed construction area would be scheduled in advance. The existing roadway system is adequate to serve the proposed construction and operations of UAV.

No significant impacts to transportation would occur during the proposed testing, training, and operations of UAV at RSA. Although the ascent/descent flight patterns of the UAVs would occur directly over and in relatively close proximity to Martin Road, the flight operations would have no significant impact on the roadway during the operation phase of the proposed action. UAV launches in the direction of Martin Road will be minimized. Traffic may need a warning or stoppage of traffic may be necessary if the wind conditions require a launch directly over the roadway. Flight operations would be scheduled with RSA Flight Operations, and each UAV operator would receive an operational flight and safety briefing prior to the operations. Flight operations would, therefore, have no significant impact on airfield operations. The proposed action will have no significant impact on RSA transportation.

## **Infrastructure**

Infrastructure addresses those facilities and systems that provide power, water, wastewater treatment, and the collection and disposal of solid waste.

**Electric Power.** The Tennessee Valley Authority (TVA) through a number of local distribution companies provides electric service to RSA. Substantial excess capacity is available. The site under consideration for construction was utilized previously and has existing power poles and ready electrical service. The power supply is sufficient to meet the expected increase in demand from the proposed action. A powerline stretches across the ascent/descent pathway for the UAV Launch/Recovery site. The line is not of sufficient height that it will need to be placed underground. No significant interruptions to electrical service will occur as a result of construction of the UAV Launch/Recovery site. Any foreseeable interruptions to electrical service will be scheduled in order to minimize the disruption. No significant impacts to electric power would result from the proposed project.

**Natural Gas.** RSA obtains natural gas through Huntsville Utilities for two sources: (1) an uninterruptible supply metered to the family housing areas, and (2) uninterruptible supply metered to the rest of RSA through a station on Patton Road. The natural gas supply is of sufficient capacity to support the proposed new facility. No significant impacts to the natural gas supply would result from the proposed project.

**Water.** RSA obtains the majority of its water supply from the Tennessee River. Potable water is supplied from two water treatment plants--Water Treatment Plants No. 1 and No. 3. An additional 1.0 MGD of potable water can be obtained from the City of Huntsville. Water Treatment Plant No. 2 is an auxiliary backup source for industrial water.

Allowing for an average of 50 gallons of water per person per day for approximately 35 (10 occupants and 25 transients) personnel and students would result in an average demand of approximately 1750 gallons per day, or 0.00175 MGD. With a treatment capacity of 5.5 MGD and a storage capacity of 2.585 million gallons, the increase would have little impact on the system.

**Wastewater Treatment.** Wastewater is treated in a centralized plant, owned and operated by Tetra Tech, Inc. (NPDES permit #AL0062863). Sewer services have a capacity for 9 million gallons per day. At present, the daily use is only 2.9 million gallons. Thus, the system is quite capable of supporting the projected flow of 50 gallons per capita for approximately 35 personnel and students that would result in an average flow of 3,500 gallons per day, or approximately 0.0035 MGD. No significant impact would result from the proposed project.

**Solid Waste.** RSA operates a 43 acre permitted landfill for the disposal of inert material such as construction rubble, insulation, asbestos, material, treated lumber, masonry waste, rock, roofing, sand, and sheetrock. The landfill has a solid waste permit from ADEM (No. 45-03) that is valid until October 8, 2006. Concrete, millable asphalt, and trees are recycled at the landfill for use on the installation and should be segregated at the project site for transport to the landfill. Paper, cardboard, and steel are also recycled by the installation. DES Form 2435-R (Material Certification and Delivery Ticket), must be used when disposing of waste at the installation landfill and must be submitted at the time of disposal. Construction and demolition rubble must be transported by the construction contractor to the installation landfill or the Waste-to-Energy Plant.

All household trash and garbage generated on RSA is hauled off post to the Huntsville Solid Waste Disposal Authority Waste-to-Energy Plant adjacent to RSA. The plant is designed to process up to 690 tons of household, industrial, and commercial waste per day. The project site is on the refuse collection schedule for solid waste disposal. Since all household trash is hauled off-post, there would be no impact to the installation landfill. Waste materials will be handled through existing procedures maximizing recycling where possible. No significant impacts to solid waste would result from the proposed project.

No significant impacts to infrastructure would be anticipated as a result of the proposed construction activities or the proposed testing, training, or operations of UAV at RSA.

## **Land Use**

A *Redstone Arsenal Land Use Plan* was prepared in February 1999. This plan assists in planning for future growth and development and promotes compatible and coordinated uses of land. The location of the site is identified in the land use plan as a range/testing area and a restricted area (area of security concern). No land use impacts would result from the training, testing, and operations of UAV at the proposed project location or would result from the construction to accommodate the UAV operations. The construction of the proposed facility at this site would promote the compatible and coordinated use of the land. The current policy for the installation requires that for new buildings, one square foot must be demolished equal to that of the new

structure. The new building must be coordinated through the Directorate of Public Works and the Real Property office.

The construction, training, and testing of UAV would have no impact on Test Area 3. UAV activities at Test Area 3 were described in the Master Planning EA. The increased UAV activities at Test Area 3 will require some coordination with other users of the range but will have no significant impact on the activities at Test Area 3.

## **Noise**

RSA has an Installation Environmental Noise Management Program (IENMP) to identify noise sources within the installation boundary and minimize the encroachment of noise disturbances to sensitive areas both on and off the installation. Areas are designated as Zone I (compatible), Zone II (normally incompatible), and Zone III (incompatible) and were based on noise-sensitive land uses. The IENMP was intended to reduce potential noise disturbances without disrupting or inhibiting various mission activities. Sources of noise disturbance are generally located so that a buffer exists between the activities and noise sensitive areas (IENMP 2003).

The proposed project area is located on Test Area 3, which is located in the Zone I noise contour and is suitable for all types of land-use activities. Steady-state noise will be produced by the UAV as well as by the GCS generators. Hearing protection devices (HPD) will be required for the operators and personnel within close proximity to the activities (HPD within distances of approximately 204 feet, double HPD within distances of approximately 42 feet, and double HPD with limited time exposure within 29 feet). While training potentially could occur 24 hours a day for several weeks, it will be conducted at intervals of two to three periods per year. The highest noise producing activities will occur while the UAV is on the ground on the installation; there is a sufficient buffer to reduce noise disturbance to sensitive receptors to a level of non-significance. In addition, the UAVs will primarily be in the air, thus noise will be produced for a limited amount of time. The UAV will leave RSA airspace but will be confined to an altitude range of 6,000 to 10,000 feet. The Huntsville Metropolitan Area is not approved for airspace for UAV operations and will be avoided.

Some noise during flight operations off-post will be produced but will be much less than that of full size passenger and cargo aircraft. Noise produced by UAV diminishes by 2000 feet. Since all UAV flights south of the installation will be at an altitude greater than 6000 feet, flight operations will have no significant impacts on sensitive noise receptors. Steady-state noise produced by the testing, training, and operation of UAVs at RSA will not affect sensitive receptors, and, therefore, the project will have no significant noise impacts.

Some noise will be produced during construction activities. The majority of the noise producing activities will occur during normal working hours. The buffer between the location of the proposed project and sensitive receptors is sufficient to reduce noise impacts to a non-significant level. Although the City of Huntsville has a noise ordinance, RSA is outside the city limits, therefore, the city noise ordinance does not apply to the installation.

## **Socioeconomics**

Redstone Arsenal, as a major employer in Madison County, influences the local economy through direct employment of civilian and military personnel as well as through the local procurement of goods and services. Direct employment by RSA as well as employment directly generated from RSA's procurement expenditures has led to an increase in the level of economic activity and the creation of additional employment opportunities.

The proposed project will have no impacts on socioeconomics. Area socioeconomics should receive some benefit from the proposed action. While no permanent jobs would be created, the proposed construction activities would create temporary jobs and funnel money into the local economy.

## **Water Resources**

**Surface Water.** The Tennessee River is the southern boundary of the installation. Major systems that flow south through the installation to the Tennessee River include Indian Creek, Huntsville Spring Branch, and McDonald Creek. The closest surface water to the proposed project site is Indian Creek. The proposed project is not located within the 100-year floodplain (Master Plan Land Use Analysis 1999).

During construction, erosion control would include use of hay bales and silt fencing. The contractor would obtain a NPDES storm water construction permit from ADEM and comply with permit requirements, as well as all applicable Federal, state, and local laws and regulations. If the initial construction of the UAV Launch/Recovery site is likely to disturb less than one acre, then a NPDES permit would not be required. A NPDES permit would be necessary when the construction activities exceed one acre. Run-off from construction could be mitigated by a variety of methods and could include the use of a retention pond for the bioremediation of materials in the run-off.

**Groundwater.** The groundwater in local aquifers moves to lowland areas in the stream basin where it discharges through available openings and provides base flow to the local streams. The primary aquifer in the Proposed Action area is composed of Tuscumbia Limestone. The water is hard; the average pH of groundwater in Madison County is 7.5 (MICOM 1994). Groundwater flows generally to the south and can typically be found at an elevation of 580 feet above mean sea level (Geological Survey of Alabama 1975). The new building will tie into the existing sewer line at TA-3; no septic tanks will be constructed in the area. During training, the existing bathroom facilities at the adjacent buildings will be used.

No significant impacts are anticipated to surface or groundwater resources from the proposed action. Erosion control during construction would include the use of hay bales and silt fencing to prevent the movement of soils via surface waters and to mitigate the potential damage. Run-off from proposed project could be handled by a variety of methods.

Measures would be taken to prevent any discharges into groundwater and surface water. During construction, routine maintenance such as oil changes would not occur and the dumping of hazardous waste/materials would not occur. A spill plan and appropriate spill measures would be developed and used during testing and training operations. Appropriate spill prevention measures would include secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit would be present on site during training and testing operations. No pesticides, herbicides, or saline solutions would be used in the project area.

## **Conflicts with Federal, State, or Local Land Use Plans, Policies, and Controls**

The proposed action, including the construction, training, and testing activities, would occur in an area identified as a training area in the *Redstone Arsenal Real Property Master Plan Land Use Analysis* (AMCOM 1999) and is consistent with current Installation land use plans. The construction of the proposed facility at this site would promote the compatible and coordinated use of the land. Conflicts with Federal, regional, state, or local land use plans, policies, or controls would not be anticipated.



### **Energy Requirements and Conservation Potential**

Anticipated energy requirements of program activities could be accommodated within the energy supply of the region. Energy requirements would be subject to any established energy conservation practices.

### **Natural or Depletable Resource Requirements and Conservation Potential**

Other than the use of necessary building materials and construction vehicle fuels, no significant use of natural or depletable resources is required during construction. Some fuels will be used during the training and testing portions of the proposed action, but the proposed action will not use a significant amount of natural or depletable resources.

### **Irreversible or Irretrievable Commitment of Resources**

The amount of building materials and energy required for this program is relatively small. Although the proposed activities would result in some irreversible and irretrievable commitment of resources such as wood, concrete, minerals, and labor, this commitment of resources is not significantly different from that necessary for many other similar building programs. It is similar to construction activities and operations that have been carried out on the installation over recent years.

### **Adverse Environmental Effects That Cannot Be Avoided**

During construction, adverse environmental effects that cannot be avoided include fugitive dust (particulate matter) and construction equipment emissions; noise from construction activities; and the disturbance of soils. During training and testing operations, there will be some air emissions from the UAV and the generators, as well as some noise produced from the UAV and the generators. However, through implementation of the program actions and mitigations described within this document, these effects can be minimized.

### **Relationship between Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity**

The proposed action would be undertaken in accordance with the RSA Master Plan EA (MICOM 1994) that provides a management tool to aid in making operational support decisions by incorporating the concept of comprehensive planning.

### **Federal Actions to Address Environmental Justice in Minority and Low-Income Populations**

No minority or low-income populations exist within the proposed project area or within Redstone Arsenal.

## **CONCLUSIONS**

### **Impact Comparison**

The following environmental impact matrix presents a summation of the proposed action and the no-action alternative.

### Environmental Impact Matrix

Environmental Components	Proposed Action	No-Action Alternative
<i>Air Quality</i>	No Significant Impact	No Impact
<i>Health and Safety</i>	No Significant Impact	No Impact
<i>Biological Resources</i>	No Significant Impact	No Impact
<i>Cultural Resources</i>	No Impact	No Impact
<i>Hazardous Materials and Waste</i>	No Significant Impact	No Impact
<i>Geology and Soils</i>	No Impact	No Impact
<i>Transportation</i>	No Significant Impact	No Impact
<i>Infrastructure</i>	No Significant Impact	No Impact
<i>Land Use</i>	No Impact	No Impact
<i>Noise</i>	No Significant Impact	No Impact
<i>Socioeconomics</i>	No Impact (temporary construction-related employment)	No Impact
<i>Water Resources</i>	No Significant Impact	No Impact

The proposed action to conduct training, testing, and flight operations of UAV at Redstone Arsenal presents no significant impacts to environmental resources. No negative cumulative impacts will occur with the implementation of the proposed action. The no-action alternative would result in no change and no impacts.

#### **Inadvertent Discoveries**

No Phase I archaeological survey, despite an intense effort and excellent research sampling strategy, precludes the possibility that an archaeological site may be discovered during subsequent construction or clearing activities. Federal cultural resource preservation statutes mandate that should artifacts become apparent during construction or clearing, such materials should be identified and evaluated by an archaeologist. Should human remains be encountered, Federal statutes specify that work shall cease immediately and the proper authorities be notified. (*Federal Register, Rules and Regulations*, Dec. 4, 1995, Vol. 60, No. 232:62161, §10.5).

#### **Mitigative Measures, Licenses, and Permits**

The selected building contractor would obtain and comply with the NPDES construction permit from ADEM and all applicable Federal, state, and local laws and regulations.

#### ***Mitigative Measures:***

Air--Fugitive dust: During ground-disturbing, regular site-watering practices will be implemented as necessary.

Air--Vehicle emission: Contractors will implement and follow construction BMPs and ensure that construction vehicles have standard vehicle emissions control devices. Vehicles used during UAV flight operations also would have standard vehicle emissions control devices if applicable.

Biological Resources--Erosion: BMPs for erosion control, topsoil management, and revegetation will be practiced. Erosion control during construction activities will include using hay bales and silt fencing to prevent soil movement into drainage ditches or low-lying areas. The contractor will determine site-specific geotechnical conditions.

Biological Resources--Threatened and Endangered Species: Appropriate spill prevention measures would include secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit would be present on site during training and testing operations.

Ground Water: Erosion control during the construction period will include the use of hay bales and silt fencing to prevent the movement of soils via surface waters and to mitigate the potential damage. Any concerns with run-off from parking lot(s) and roofs will be mitigated using methods deemed necessary and appropriate by ADEM and/or EPA. Spill prevention measures including secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit present on site during training and testing operations.

Specific Health and Safety Plans: Governing safety regulations with which the contractor will comply include: (1) AMCR 385-100, *Safety Manual*, and all appropriate OSHA regulations, including 29 CFR Part 1926, *Safety and Health Regulations for Construction* activities; EPA regulations (40 CFR), DOT regulations for transportation issues (49 CFR), the DoD and the Department of the Army program requirements established in AMCR 385-100. The selected building contractor will comply with all applicable Federal, state, and local laws and regulations. UXO on-site support during construction. Standard Operating Procedures that include a crash plan.

Hazardous Materials/Waste: Any hazardous materials/waste generated from construction will be identified, removed from the site, and disposed in accordance with current regulations. Spill prevention measures including secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit present on site during training and testing operations.

Noise: Noise-producing construction activities will be confined to normal working hours to minimize noise impacts. Hearing Protection Devices for operators within certain distances and minimize time near UAV and generators.

Surface Water: Contractor will comply with permit requirements that ADEM deems necessary to maintain the same run-off amount that existed prior to construction, as well as all applicable Federal, state, and local laws and regulations. Spill prevention measures including secondary containment for stored fuel, drip pans under generators and stationary vehicles, and a spill mitigation kit present on site during training and testing operations.

Transportation: Interruptions to utility service or the roadway system outside the proposed construction areas will be scheduled in advance. Launch/Recovery will be minimized over Martin Road. UAV flights only allowed when Redstone Air Traffic Control Tower is in operation.

***Permits:***

1. Air: Title V Air Permit (Permit #: 7090007) issued by ADEM to RSA on July 7, 2003. Allows RSA to regulate all emission sources under one permit.
2. Solid Waste: The landfill has a permit from ADEM (No. 45-03) that is valid until October 8, 2006.
3. Wastewater Treatment: Tetra Tech, Inc., central plant owner-operator, holds National Pollutant Discharge Elimination System Permit Number AL0062863.
4. Storm Water: Contractor would obtain a NPDES storm water construction permit from ADEM if the construction exceeds one acre.

## APPENDIX A

### References

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Army Regulation 200-2, *Environmental Analysis of Army Actions*, Federal Register Vol. 67, No. 61, March 29, 2002.

**APPENDIX B**  
**Preparers of And Individuals And Agencies**  
**Contributing to The Environmental Assessment**

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**Agencies/Organizations Sent Copies of the Assessment**

**To meet CEQ Regulations of NEPA, U.S. Army is circulating this EA to:**

U.S. Army Garrison-Redstone, DES, Natural Resources, Redstone Arsenal, Alabama.  
U.S. Army Garrison-Redstone, DPW, Master Planning Division, Redstone Arsenal, Alabama. U.S.  
Environmental Protection Agency, Region IV, Office of Environmental Assessment, Atlanta, Georgia.  
U.S. Fish and Wildlife Service, Ecological Services Division, Daphne, Alabama.

**APPENDIX C**  
**FAA Letter and Approval**

<b>DEPARTMENT OF TRANSPORTATION</b> <b>FEDERAL AVIATION ADMINISTRATION</b>	
<b>CERTIFICATE OF AUTHORIZATION</b>	
<b>ISSUED TO</b> Department of the Army, Program Executive Office/Aviation, Redstone Army Arsenal	
<b>ADDRESS</b> Department of the Army Program Executive Office, Aviation Unmanned Aerial Vehicle Systems Project Office Redstone Arsenal, Alabama 35898	
<b>This certificate is issued for the operations specifically described hereinafter. No person shall conduct any operation pursuant to the authority of this certificate except in accordance with the standard and special provisions contained in this certificate, and such other requirements of the Federal Aviation Regulations not specifically waived by this certificate.</b>	
<b>OPERATIONS AUTHORIZED</b> The conduct of Unmanned Aerial Vehicle (UAV) flights, specifically Hunter (RQ5A) and Shadow (RQ7A) UAVs within the described areas not contained within Restricted Area R-2104 or the Redstone Class D airspace and operating procedures as stated under the special provisions in attachment.	
<b>LIST OF WAIVED REGULATIONS BY SECTION AND TITLE</b>  <div style="text-align: center;">***** Not Applicable *****</div>	
<b>STANDARD PROVISIONS</b>	
<ol style="list-style-type: none"> <li>1. A copy of the application made for this certificate shall be attached and become a part hereof.</li> <li>2. This certificate shall be presented for inspection upon the request of any authorized representative of the Federal Aviation Administration, or of any State or municipal official charged with the duty of enforcing local laws or regulations.</li> <li>3. The holder of this certificate shall be responsible for the strict observance of the terms and provisions contained herein.</li> <li>4. This certificate is nontransferable.</li> </ol>	
<b>Note-This certificate constitutes a waiver of those Federal rules or regulations specifically referred to above. It does not constitute a waiver of any State law or local ordinance.</b>	
<b>SPECIAL PROVISIONS</b>	
Special Provisions No. 1 through 12 inclusive are set forth and attached.	
<p>This certificate is effective from <b>March 15, 2004</b> through <b>March 14, 2005</b>, and is subject to cancellation at any time upon notice by the Administrator or his/her authorized representative.</p> <div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div style="text-align: center;">   <u>Southern Region</u>  <small>(Region)</small>   <u>15 March 2004</u>  <small>(Date)</small> </div> <div style="text-align: center;"> <b>BY DIRECTION OF THE ADMINISTRATOR</b>     <small>(Signature)</small>   <u>Manager, Operations Branch</u>  <small>(Title)</small> </div> </div>	

FAA Form 7744-1 (7-74)



15 March 2004

**SPECIAL PROVISIONS**

1. The Unmanned Aerial Vehicle (UAV) operations shall provide an equal level of safety comparable to see-and-avoid requirements for manned aircraft by utilizing chase aircraft for visual observance and/or the Redstone Air Traffic Control radar and only in visual meteorological conditions.
2. UAV flight operation shall be confined to the Redstone Class D airspace, Restricted Area R-2104, Operation Area North and Operation Area South, as described in AMSAM-RA-FO letter dated 2 Feb. 2004, Attachment 1.
3. UAV flight operations shall only be conducted during times when the Redstone Air Traffic Control Tower (ATCT) is operational and R-2104 is activated for its use.
4. The UAV shall be equipped with an altitude encoding transponder that meets the specifications of 14 CFR, section 91.215 and shall squawk the Mode 3/C assigned by ATC prior to departure and shall remain on said squawk until having landed and power secured.
5. Should the transponder become inoperative, at the discretion of the Redstone ATCT or Huntsville ATCT, UAV flight operations may be cancelled and/or recalled.
6. The UAV shall be equipped with standard aircraft position lights and anti-collision strobe lights in accordance with 14 CFR, section 23.1401 and shall operate during all phases of flight.
7. Instantaneous two-way communications shall be maintained with the Redstone ATCT and Huntsville ATCT as applicable to the area of launch/landing and area of flight operations within Redstone Class D and Huntsville Class C airspace. Compliance with all ATC clearances shall be mandatory.
8. Ten minutes prior to departure or entering controlled airspace (Class C or D), approval shall be obtained from the Redstone ATCT or Huntsville ATCT as applicable prior to the UAV entering the applicable ATCT's airspace, indicating planned operational altitude(s), direction of flight to the area and operations area (North, South).

9. While navigating within Class C or D airspace during departure, recovery or during mission operations, the UAV shall maintain any altitudes, headings and clearances assigned by Air Traffic Control until rescinded or cancelled by said ATCT.
10. The U.S. Army, Program Executive Office/Aviation, Redstone Arsenal, shall be responsible at all times for collision avoidance maneuvers with nonparticipating aircraft and the safety of persons and/or property on the surface.
11. All UAV operations shall contain a means to safely terminate the flight, and/or follow specified procedures for mission abort, which would insure that the UAV shall not pose any danger to aviation, persons or property on the surface.
12. The U.S. Army, Program Executive Office/Aviation, Redstone Arsenal, shall notify this office of any UAV malfunctions requiring flight termination, a loss of control and/or loss of UAV

**THIS CERTIFICATION OF AUTHORIZATION DOES NOT, IN ITSELF, WAIVE ANY FEDERAL AVIATION REGULATION (FAR). THE UNITED STATES ARMY IS HEREBY AUTHORIZED TO OPERATE UAVs IN THE AREAS DESCRIBED, DURING THE DATES AS SPECIFIED IN THE CERTIFICATE OF AUTHORIZATION.**



REPLY TO  
ATTENTION OF

AMSAM-RA-FO

**DEPARTMENT OF THE ARMY**  
UNITED STATES ARMY GARRISON-REDSTONE  
4488 MARTIN ROAD  
REDSTONE ARSENAL, ALABAMA 35898-5000

2 February 2004

MEMORANDUM FOR Department of the Army, Regional Representative, FAA Southern Region, ATTN: ATAS-AS-SO, P.O. Box 20636, Atlanta, GA 30320

SUBJECT: Revision of Certificate of Authorization-Shadow Unmanned Aerial Vehicle (UAV) Operations at Redstone Arsenal, AL

1. Reference memorandum, AMSAM-RA-FO, subject: Certificate of Authorization-Shadow Unmanned Aerial Vehicle (UAV) Operation at Redstone Arsenal, AL, 19 December 2003.
2. At the request of the FAA Southern Region attachment 1 of the 19 December 2003 Request a Certificate of Authorization (COA) to operate the RQ-7A Shadow 200 UAV outside of Restricted Areas R2104 has been amended.
3. The following sections of attachment 1 have been changed in order to clarify some of the questions and concerns from the FAA Southern Region about airspace and the see and avoid issues.
  1. Detailed description of the intended flight operation including the classification of the airspace to be utilized.  
*Classification of Airspace.*
  4. Method of pilotage and proposed method to avoid other traffic  
*Traffic Avoidance.*
  6. Communications procedures.
  8. Lost link/mission abort procedures.
4. The point of contact is the undersigned at DSN 788-2343, Comm 256-842-2343 or email: john.burkhead@redstone.army.mil.

Encl

/s/  
JOHN S. BURKHEAD  
Installation Air Traffic and Airspace Officer

AN EQUAL OPPORTUNITY EMPLOYER



REPLY TO  
ATTENTION OF

AMSAM-RA-FO

**DEPARTMENT OF THE ARMY**  
UNITED STATES ARMY GARRISON-REDSTONE  
4488 MARTIN ROAD  
REDSTONE ARSENAL, ALABAMA 35898-5000

19 December 2003

MEMORANDUM FOR Department of the Army, Regional Representative, FAA Southern Region, ATTN: ATAS-AS-SO, P.O. Box 20636, Atlanta, GA 30320

SUBJECT: Certificate of Authorization-Shadow Unmanned Aerial Vehicle (UAV) Operations at Redstone Arsenal, AL

1. Reference:

a. Army Regulation 95-2, Aviation, Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational Aids, 10 August 1990.

b. FAA Order 7610.4J, Special Military Operations, 3 November 1998.

2. Request a Certificate of Authorization (COA) to operate the RQ-7A Shadow 200 UAV outside of Restricted Areas R2104. The documentation for this COA in accordance with Chapter 12, Special Military Flights and Operations, Section 9, Remotely Operated Aircraft (ROA) of FAA Order 7610.4J is detailed in the enclosed attachments.

3. In support of national security, the deployment of two National Guard Military Intelligence UAV units into the Iraq Theater of Operations has been ordered. As a result of this, these units will receive training on the Shadow 200 UAV System prior to deployment. Normally, soldier training on the system is conducted at the UAV Schoolhouse in Fort Huachuca, AZ. However, due to the immediate need to conduct training which satisfies the unit's mobilization orders and the inability of the existing training facility to conduct the training, an alternate training site must be identified. US Army Garrison-Redstone has been identified as the preferred training location. Due to the large amount of coordination required to set up operations, this office hereby request expedited handling in the processing of this request for Certificate of Authorization.

4. The point of contact is the undersigned at DSN 788-2343, Comm 256-842-2343 or email: john.burkhead@redstone.army.mil.

Encls

/s/  
JOHN S. BURKHEAD  
Installation Air Traffic and Airspace Officer

AN EQUAL OPPORTUNITY EMPLOYER

**1. Detailed description of the intended flight operation including the classification of the airspace to be utilized.**

***Description of Flight Operations Area:***

Two areas are requested. The first area will be identified as UAV Operations Area North which would encompass Redstone Arsenal property that is not included in R2104A, B, and C from the surface to 10,000 feet MSL. UAV Operations Area South would be an area south of R2104A & B, south of the Tennessee River approximately 5 nautical miles from 6,000 feet MSL to 10,000 feet MSL. UAV Operations Area South's boundary is defined from Lat. 34°35'02"N., Long. 86°43'25"W.; thence east along the Tennessee River to Lat. 34°35'05"N., Long. 86°35'24"W.; to Lat. 34°30'5"N., Long. 86°35'24"W.; to Lat. 34°30'5"N., Long. 86°42'25"W.; thence to the point of beginning.

***Classification of Airspace:***

The UAV Operations Area North from the surface to 2,400 feet MSL is within Redstone Air Traffic Control Towers Class D airspace. When the Redstone Tower is closed the airspace reverts to Class G. From 2,400 feet MSL to 10,000 feet MSL the airspace is within Huntsville Approach Control's Class C. When Huntsville Approach is closed the airspace reverts to Class E. All of UAV Operations Area South airspace is either in Huntsville's Class C or Class E. The UAV will not be operated in any Class G airspace.

**2. ROA physical characteristics.**

***UAV System Characteristics:***

The RQ-7A Shadow 200 is a small tactical unmanned aerial vehicle with a 12.8 foot wingspan and 11.2 feet in length. The maximum gross weight is 330 pounds. Propelled by a 38 hp rotary engine with a pusher propeller configuration, the Shadow 200 carries a maximum MoGas fuel load of approximately 10 gallons, providing an endurance of four to five hours. Controlled by an automatic takeoff and landing system, it is rail catapult launched and uses a tailhook for rolling arrested recoveries, both within the area the size of a soccer field. Emergency landings are by use of a parachute. The air vehicle has standard aircraft red and green position lights, a white anti-collision strobe light arrangement, a remotely programmable Mode 3A/C and Mode 4 (IFF) transponder, and GPS navigation. Navigation can be preprogrammed autonomous or through direct control by an air vehicle operator (AVO). Autonomous navigation is for executing preprogrammed missions via GPS waypoints and certain emergency procedures.

Recovery and landing is typically performed autonomously by the Tactical Automated Landing System (TALS), a process similar to an Instrument Landing System (ILS) approach for manned aircraft. An AVO located in the Ground Control Station (GCS) controls the air vehicle, continually monitoring system status, and maneuvers the air vehicle as desired. The downlink data includes a display of health and status parameters such as attitude, magnetic heading, indicated airspeed, GPS position, barometric altitude, rate of climb, engine instrumentation, and warnings and cautions. Air vehicle position is displayed onto a high-resolution digital map within the GCS. The primary and backup links have an operational range of 109 nautical miles. Both links incorporate error detection to ensure that erroneous interference is not processed by the avionics. Two separate up-link frequency bands and a directional antenna are incorporated to minimize communication link issues due to interference.

An assigned Mission Commander maintains oversight for the operation. A typical Shadow system incorporates two ground control stations with an ability of transferring control from one

## Attachment 1

to the other. For launch/recoveries, an additional air vehicle operator is located in the Portable GCS for redundancy. Radio contact is continuously maintained with air traffic control (ATC) during missions.

### **3. Flight performance characteristics.**

The Shadow 200 maximum airspeed is 110 knots with a stall speed of 55 knots and cruise/loiter airspeed of ~70 knots. Maximum rate of climb is approximately 1,500 ft/min and normal mission altitude is 6,000'-14,000' MSL. An air vehicle description is provided at Attachment 3.

### **4. Method of pilotage and proposed method to avoid other traffic.**

#### *Method of Pilotage:*

Flights are managed within the GCS via uplink commands. Although most flights are performed by programmed GPS waypoint navigation, the aircraft may be flown manually with heading, altitude, and airspeed commands. This allows for responsive maneuvering if desired by ATC. During pre-flight mission planning, the specific route is programmed within the GCS. Once airborne, the Shadow air vehicle typically initiates flight along this stored flight plan route unless maneuvering for traffic or mission requirements necessitates a deviation.

#### *Traffic Avoidance:*

To affect a see-and-avoid capability, one of the following methods will be utilized:

1. Redstone air traffic control will maintain radar contact and continuously monitor the UAV position while observing any potential conflicting traffic or. 2. Chase plane will provide traffic avoidance by visual observance. With little exception, flights will be within the controlled environment of the restricted areas, within or above Huntsville's Class C airspace, or within Redstone's Class D airspace. Both the Class C and Class D demand the establishment of radio contact for manned aircraft while an operational Mode 3A/C transponder is mandated within and above the Class C airspace. These established FAA requirements minimize risks associated with traffic conflict for UAV operations. Flights outside of restricted areas will be at higher altitudes, above 2400 MSL over Redstone Class D, and 6000 ft MSL and higher when operating south of the restricted areas. At these altitudes, primary and secondary radar targets can be easily detected by radar. Initial discussions with Mr. Ray Palmer, the Manager of Huntsville's Air Traffic Control Tower, has indicated UAV flights will not impose any significant affect upon other traffic. The operations area proposed is typically low in traffic count for aircraft operating without transponders. During UAV flights which use radar contact for traffic avoidance, U.S Army Air Traffic Controllers will provide transponder equipped and non- transponder equipped traffic point-outs to the AVO. For traffic avoidance, requests for changes in course and/or altitude will be relayed by Redstone ATC to the AVO.

### **5. Coordination procedures.**

Prior to initial UAV operations, each AVO will receive an operational flight and safety briefing from Redstone Flight Operation. All UAV flights will file a flight plan with Redstone Flight Operations that originate from within Redstone Arsenal.

For all flights outside of the Restricted Areas of R2104, the Mission Commander must notify Redstone Flight Operations during normal business hours in order for Redstone Flight Operation to coordinate and issue a Notice to Airmen (NOTAM).

**6. Communications procedures.**

A procedure will be implemented to ensure reliable UHF or VHF communication is established between the AVO and the air traffic control facility at Redstone AAF prior to launch of the Shadow UAV. A redundant means of communication via ground links will be implemented. The UAV AVO will monitor and then broadcast intended launch on the Redstone tower frequency and Redstone ATC will coordinate with Huntsville approach control if flights are to transition outside of the restricted areas. The AVO or Mission Commander will obtain permission to depart Redstone's restricted airspace.

**7. Route and altitude procedures.**

The Shadow UAV will launch and recover from within the R2104C restricted areas. Climbing to mission altitude will be performed within the boundaries of Redstone Arsenal. Once at altitude, the air vehicle will fly various search and loiter patterns within the area of operations. Flights to and from the extended operations area south of the restricted areas will only be conducted while at altitudes from 6,000 to 10,000 feet MSL. The lower altitudes necessary for launch and recovery and for climbs/descents will be achieved while in the restricted areas or in or above Redstone's Class D airspace.

**8. Lost link/mission abort procedures.**

Lost link procedures involve a preprogrammed lost link schedule for the air vehicle to navigate to and loiter around a predetermined lost link waypoint in restricted area R2104A. The Shadow's flight control system will be pre-programmed to autonomously fly to this designated orbit point at a specified altitude. The waypoint will be located approximately 3 nautical miles southeast of the GCS, a geographic location where the potential for reacquiring direct control of the UAV is enhanced. A direct flight route to the lost link waypoint will be utilized at a flight altitude acceptable to air traffic control. If the re-establishment of link is not accomplished, the air vehicle will remain in loiter until a flight termination command is autonomously executed and the parachute deployed is deployed. If lost link procedures are executed, the Mission Commander or AVO will immediately broadcast recovery intentions to the Redstone tower.

**9. A statement from the DOD proponent that the ROA is airworthy.**

Attachment 4

## Redstone UAV Operations Area

The map displays the Huntsville, Tennessee area with various flight restrictions. Key features include:

- UAV Area of Operations (North):** A purple-shaded region in the northern part of the map, bounded by a purple line. It includes labels for "10,000 SFC MSL" and "10,000 2,400 MSL".
- UAV Area of Operations (South):** A green-shaded region in the southern part of the map, bounded by a green line. It includes labels for "10,000 SFC MSL" and "10,000 6,000 MSL".
- Existing Restricted Areas:** A red-shaded region in the central part of the map, bounded by a red line. It includes labels for "10,000 SFC MSL" and "10,000 2,400 MSL".

The map also shows various other flight-related information, including altitudes (e.g., 10,000, 15,000, 20,000), frequencies (e.g., 119.1, 119.2, 119.3), and locations (e.g., Huntsville, Decatur, Anniston, Wheeler National Wildlife Refuge).



## AAI RQ-7A Shadow 200

### Power plant

One 28.3 kW (38 hp) UEL AR 741 rotary engine; two-blade fixed-pitch wooden pusher propeller. Fuel (39.7 litres; 10.5 US gallons; 8.7 Imp gallons) in fire-retardant, explosion-proof wing cells. Growth option for eventual heavy fuel power plant.

### Dimensions

Wing span	12 ft 9.0 in
Wing area	23.0 ft <sup>2</sup>
Length overall	11 ft 2.0 in
Height overall	3 ft 0.0 in
Propeller diameter	2 ft 2.0 in

### Weights

Weight empty	200.6 lb
Max fuel weight	63 lb
Max payload	55.7 lb
Max launching weight	328 lb

### Performance

Max level speed at S/L	105 kt
Max cruising speed	84 kt
Loiter speed: at S/L	70 kt
Optimum climbing speed	80-85 kt (92-98 mph)
Stalling speed at S/L	55 kt (64 mph)
Max rate of climb at S/L	1,500 ft/min
Ceiling	14,000 ft
T-O run	820 ft
Operational radius	50 km
Max datalink range	67.5 n miles
Max endurance	4-5 h
g limit	+3.6
	-2.0

### Launch

Automatic ground launch by hydraulic catapult, or by conventional wheeled take-off.



### Recovery

Automatic wheeled landing.

### Transportation

Air vehicle can be dismantled and stored/transported in a 0.61 × 0.61 × 1.65 m (2 × 2 × 5.4 ft) container; can be carried by two people. Complete system air-transportable in two C-130 aircraft.

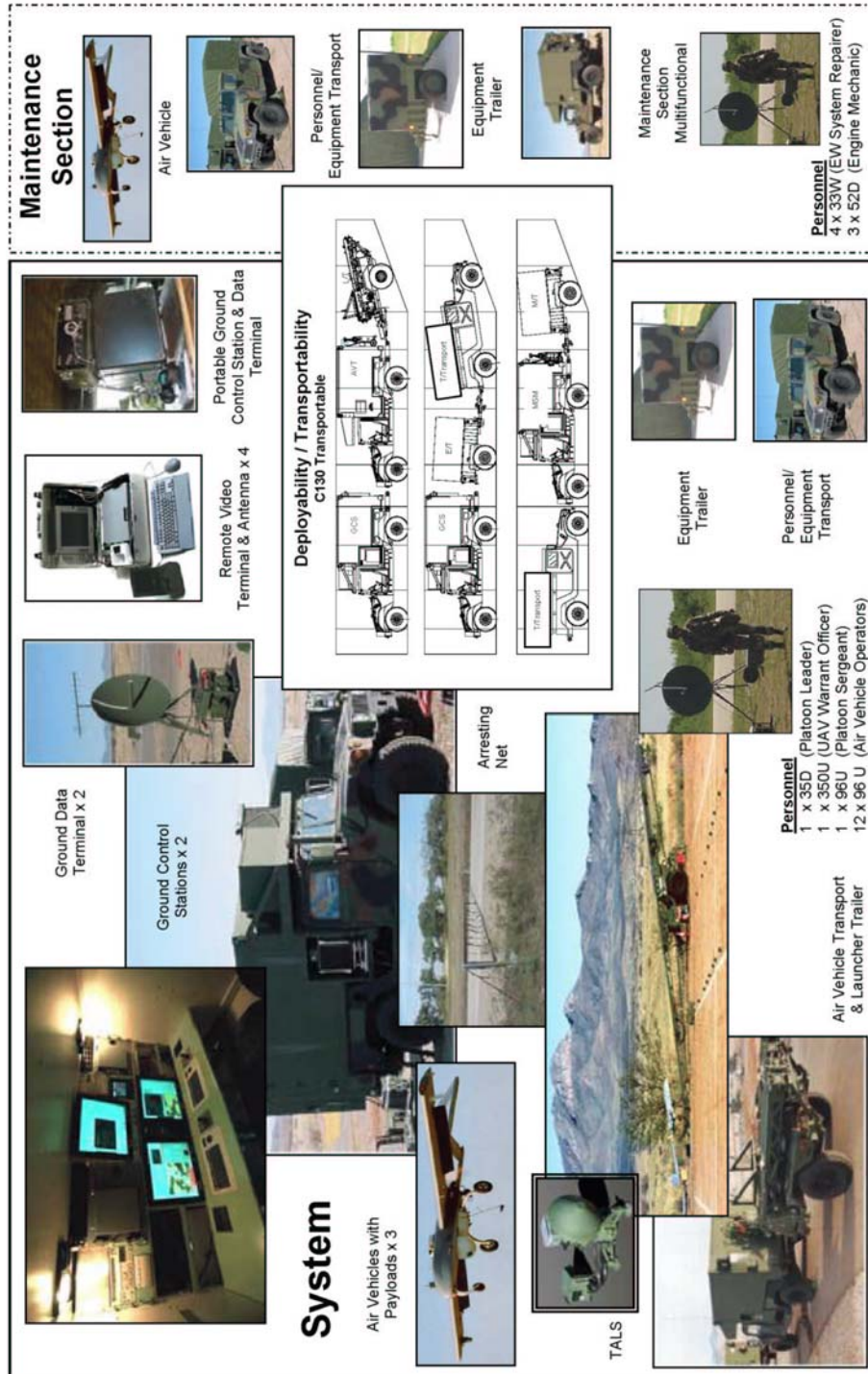
### System composition

Four air vehicles with payloads; six HMMWVs; two mobile Raytheon Systems GCSs; four RVTs and antennas; one portable GCS and one GDT. One HMMWV transports the UAVs and the hydraulic launch trailer; two others each transport one GCS, two are troop and equipment carrier vehicles, and the sixth carries associated support equipment. US Army ground crew of 22.

### Operational status

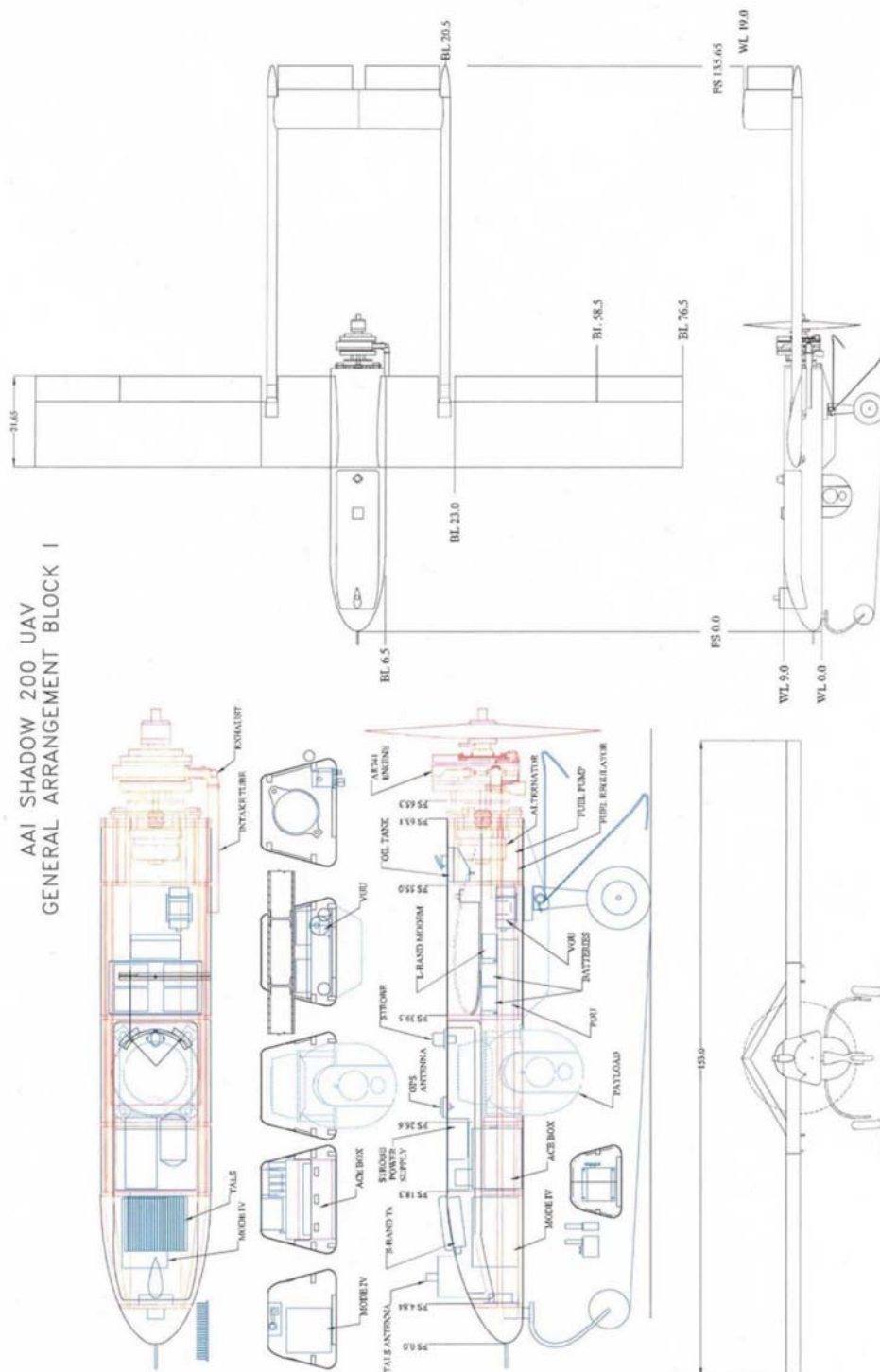
Selected as winner of US Army Tactical UAV (TUAV) competition in December 1999; initial LRIP contract of US\$41.8 million for four Shadow 200 systems; delivered from November 2000; option for further four LRIP systems exercised with award of US\$19.4 million contract on 11 April 2001. Field qualification tests at Fort Huachuca, Arizona, completed in March 2001; IOT&E at Fort Hood, Texas, began at the end of April 2001 and was completed successfully in May 2002, at which time some 1,700 hours in 900 flights had been completed. A Lot 2 LRIP contract (US\$22.3 million for five systems) was awarded in March 2002; Milestone C (approval for full-rate production) was achieved on 1 October 2002 and was expected to result in an order for nine systems during FY03 at a cost of approximately US\$99 million. The RQ-7A was fielded in October 2002 to the US Army's 1st and 2nd Stryker Brigade Combat Teams (BCTs) at Fort Lewis, Washington, the 4th Infantry Division at Fort Hood, Texas, and for crew training to Fort Huachuca. All six Stryker BCTs are due to receive the Shadow system by May 2006.

# Shadow 200 System Baseline



# Attachment 3

## AAI SHADOW 200 UAV GENERAL ARRANGEMENT BLOCK I



Attachment 4

Shadow UAV Airworthiness



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
PROGRAM EXECUTIVE OFFICE, AVIATION  
5681 WOOD ROAD  
REDSTONE ARSENAL AL 35898-5000

SFAE-AV-UAV

19 December 2003

MEMORANDUM FOR

Department of the Army Regional Representative, FAA Southern Region,  
ATTN: ATAS-AS-SO, POB 20636, Atlanta, GA 30320

SUBJECT: Authorization of Shadow Tactical Unmanned Aerial Vehicle System (UAVS)

To Whom It May Concern:

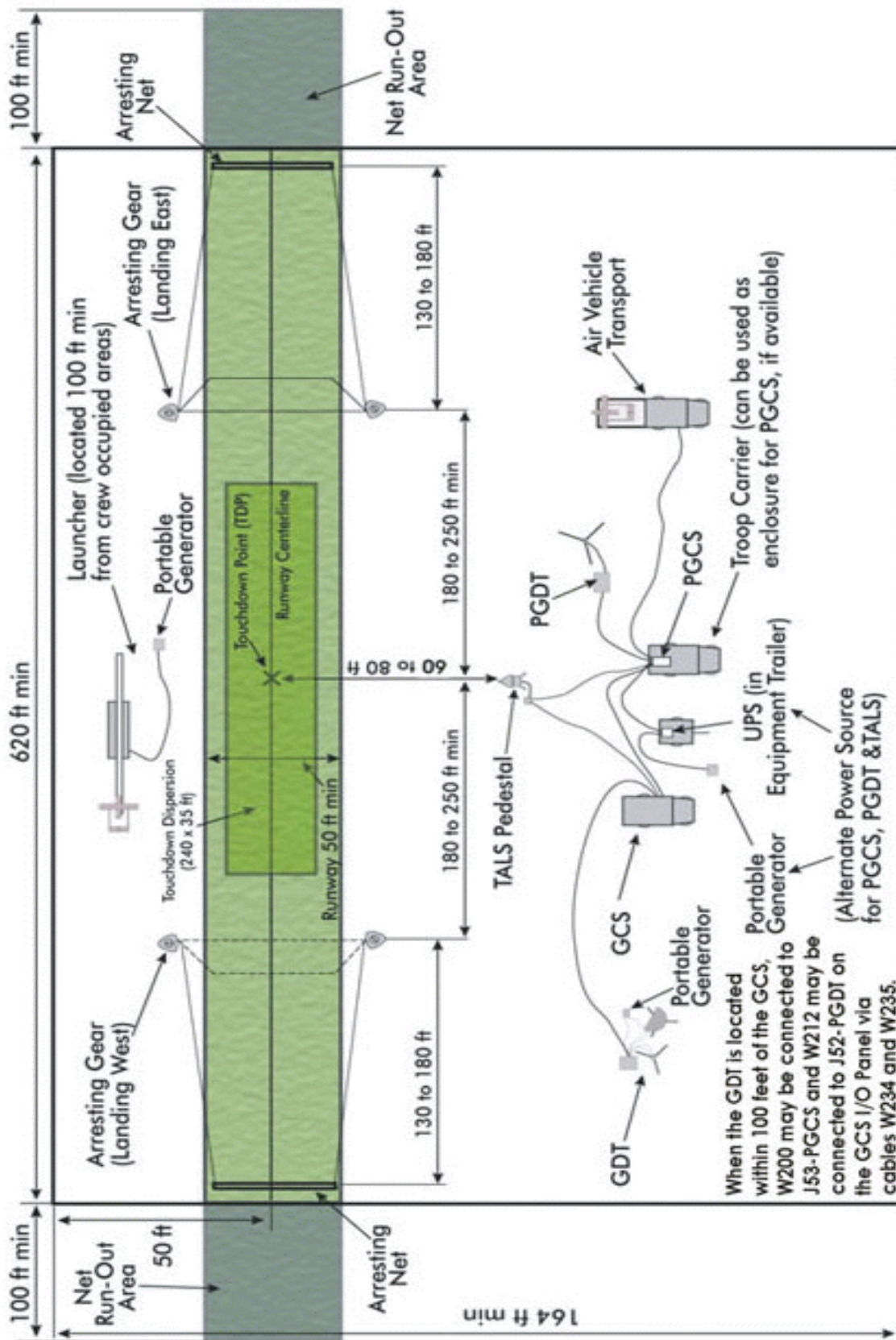
1. The Shadow Tactical Unmanned Aerial Vehicle System (UAVS) received its System Safety Release and Material Fielding Release from the U.S. ARMY authorizing the fielding of these systems to operational units. The system has accumulated greater than 7000 flight hours. More than 3000 of these hours have been accumulated in support of Operation Iraqi Freedom.
2. The Shadow UAV System is only operated by trained and certified operators, or student trainees under the direct supervision of trained, certified operators. The system is used to conduct operational surveillance and training. None of the flight profiles used during these missions contains any aerobatics or other dangerous maneuvers that would be outside the operational envelope of the system. No flight critical failures that resulted in the loss of control have occurred outside of launch and recovery operations.
3. This vehicle is manufactured using standard techniques employing some composite materials and off the shelf cameras and navigational components. The vehicle contains no hazardous materials. Shadow is powered by a 38 hp rotary engine and holds 10.5 U.S. gallons of fuel in fire-retardant, explosion-proof wing cells.
4. The Shadow UAV has demonstrated satisfactory airworthiness qualities over an extended period of time and is now considered by this office and the U.S. Army a fully operational, fielded, and airworthy system.
5. Point of contact for this action is Tim Owings, APM Shadow UAV, 256-895-4310.

A handwritten signature in cursive script, reading "John D. Burke", is positioned above the typed name and title.

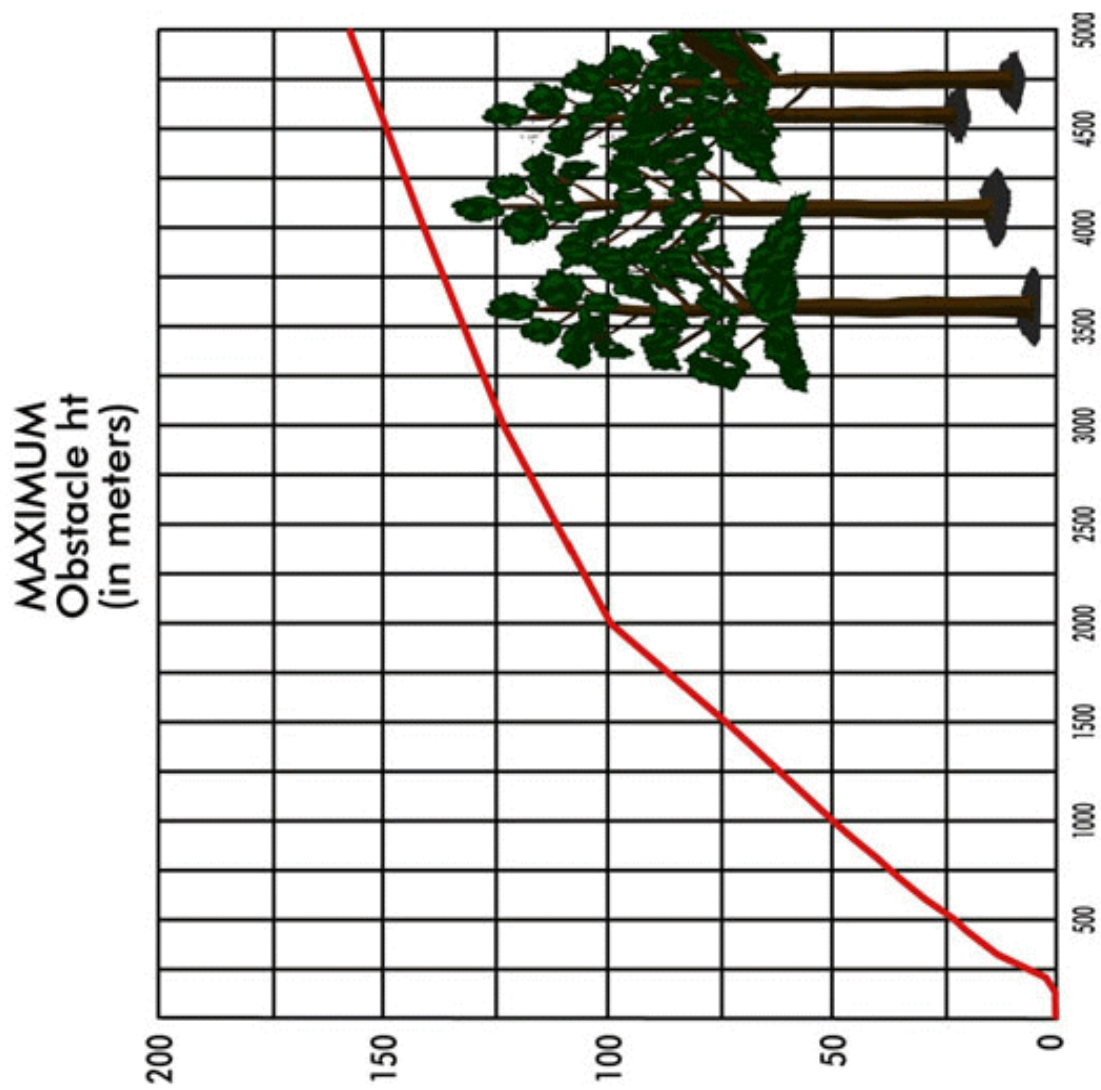
John D. Burke  
Colonel, Signal Corps  
Project Manager  
Unmanned Aerial Vehicle Systems



**APPENDIX D**  
**Site Criteria**



Generalized Diagram of UAV Shadow Operating System.



Climbing Rate per Distance for the UAV.

**APPENDIX E**  
**Safety Letters**





DEPARTMENT OF THE ARMY  
HEADQUARTERS, U.S. ARMY DEVELOPMENTAL TEST COMMAND  
314 LONGS CORNER ROAD  
ABERDEEN PROVING GROUND MD 21005-5055



REPLY TO  
ATTENTION OF

CSTE-DTC-TT-S (70-10p)

28 AUG 2002

MEMORANDUM FOR Project Manager, Tactical Unmanned Aerial Vehicle, (SFAE-IEW&S-UAV-TM), Redstone Arsenal, AL 35898-3000

SUBJECT: Safety Confirmation for the Tactical Unmanned Aerial Vehicle (TUAV), DTC Project No. 6-AI-53E-UAV-090

1. References:

- a. Safety Assessment Report Update for the TUAV LRIP, AAI Corp, Report No. R38085-00020 Rev D, July 2002.
- b. Memorandum, USASC, CSSC-OA, 17 Jul 02, subject: Independent Safety Assessment for the Tactical Unmanned Aerial Vehicle, RQ-7A.
- c. Memorandum, USACHPPM, MCHB-TS-OHH, 11 Jan 02, subject: Updated Health Hazard Assessment Report on the Shadow 200, Tactical Unmanned Aerial Vehicle (TUAV), Block I, Project No. 69-37-7732-02.
- d. Minutes for the System Safety Working Group Teleconference, 8 Aug 02.

2. Scope and Applicability: This is the safety confirmation to support the production and fielding of the Shadow 200 TUAV.

3. System Description: The Shadow 200 is a TUAV that provides the Brigade Commander near real time video surveillance out to a range of 50 kilometers. (A complete description is provided in SAR paragraph 1.0). It consists of a number of subsystems including the following:

- a. Ground Control Station (GCS). The GCS will be utilized for prelaunch, launch, recovery and operation of TUAVs and their payloads. The GCS is mounted on a HMMWV equipped with an S-788 II Shelter with towing capability, a generator, and an Environmental Control Unit.
- b. Ground Data Terminal (GDT). The GDT is the antenna subsystem attached to the GCS. It uses COTS transceivers and controls a COTS Differential GPS Base Station (DGBS). The antenna includes a 4-foot antenna dish that is transported within the GCS vehicle.
- c. Portable Ground Control Station (PGCS). The PGCS is a functional subset of the GCS. It allows control capability for preflight, launch and recovery of the air vehicle.

d. Portable Ground Data Terminal (PGDT). The PGDT is very similar to the GDT, but allows flexibility in the selection of operating locations.

4. Critical Technical Parameters. Safety and health hazards associated with the operation, transportation, and maintenance of the Shadow 200 TUAV shall be eliminated or controlled to an acceptable level, in accordance with AR 385-16.

CSTE-DTC-TT-S

SUBJECT: Safety Confirmation for the Tactical Unmanned Aerial Vehicle (TUAV),  
DTC Project No. 6-AI-53E-UAV-090

24 AUG 2002

5. Limiting Factors: None

6. Evaluation Results.

a. The incorporation of the CHPPM recommendations (ref c) mitigated the initial UAV engine noise level hazard to no residual hazard.

b. The system safety program issues in the Army Safety Centers Independent Safety Assessment for the TUAV (ref 1b) were all addressed.

c. There was a system safety working group teleconference convened on 8 Aug 02 (Ref 1d). During the meeting, all open hazard items listed in the Safety Assessment Report (SAR) (ref 1a) were either closed or closure action required identified. All safety hazards have been either corrected or mitigated to an acceptable level as outlined below:


(1) UPS battery venting into the GCS. Has been assessed as a Critical, Improbable (2E), Low risk hazard. This hazard will be corrected to a zero risk hazard when vents to the outside air are included in the shelter for the UPS battery. If design change is not incorporated, a System Safety Risk Assessment must be concurred in and signed by the Project Manager.

(2) Operator could inadvertently initiate the UAV engine starter, with the single action spring-loaded on-off switch. This hazard is mitigated to a marginal, remote (3D), low risk hazard with the addition of warnings to the manuals and the delta training conducted. The System Safety Risk Assessment must be provided the Project Manager for concurrence and acceptance of risk.

7. Conclusion and recommendations: The TUAV Shadow 200 system is considered safe for operation, training and fielding, when the requirements of paragraphs 6c above have been completed and confirmed.

8. Point of contact at this headquarters is Mr. Nick Borns, CSTE-DTC-TT-S, bornsn@dtc.army.mil, DSN 298-1216 or COMM 410-278-1216.

FOR THE COMMANDER:

  
RICHARD K. SPARKS  
Chief, Soldier, C3 and IEW Division  
Directorate for Test and Technology

CF:

ATEC, (CSTE-ILE-S, CSTE-OP-CO)

AMC, (AMSCF-E)

TRADOC, (ATCS-S)

USASC, (CSSC-O)

USACECOM, (AMSEL-SF-FB), 10150 Craig Hill Rd., Fort Belvoir, VA 22060-5851

MEMORANDUM FOR AMSAM-MMC-MA-NI (H. Allen)

SUBJECT: Tactical Unmanned Aerial Vehicle (TUAV) System Safety Suitability Statement

1. References:

a. Memorandum, AMSAM-MMC-MA-NI, 22 Feb 02, subject: Manpower and Personnel Integration (MANPRINT) System Safety (SS) Domain Assessment.

b. TUAV Block I Hazard Summary and Log as modified on 2 May 02 at the TUAV System Safety Working Group Meeting.

c. Tactical Unmanned Aerial Vehicle Operational Requirements Document (ORD), 11 Mar 99.

2. As requested in 1a, this system safety suitability statement is provided as input to the RQ-7A, TUAV system Type Classification, Milestone C, and Materiel Release decision review process in accordance with regulatory requirements.

3. As a result of UAV maturity shown by previous UAV programs, the TUAV Project Office received approval to proceed with a competitive acquisition for TUAV, which included a System Capability Demonstration (SCD). After successfully completing the SCD, the TUAV Project Office sought and received Milestone II approval for the TUAV acquisition program to enter a Low Rate Initial Production/Engineering Manufacturing Development (LRIP/EMD) phase. A Full Rate Production (FRP) Decision (MS-C) is being sought, having successfully completed block upgrades and Initial Operational Test and Evaluation (IOT&E).

4. The Tactical Unmanned Aerial Vehicle consists of a ground maneuver Brigade Commander's primary day/night, Reconnaissance, Surveillance, and Target Acquisition (RSTA) system. The TUAV will provide the commander with a number of benefits to include enhanced enemy situational awareness, a target acquisition capability, battle damage assessment (BDA), and enhanced battle management capabilities (friendly situation and battlefield visualization). The TUAV system consists of two Ground Control Stations (GCS), two Ground Data Terminals (GDTs), one Portable Ground Control Station (PGCS), one Portable Ground Data Terminal (PGDT), four Remote Video Terminals (RVTs), Modular Mission Payloads (MMPs), and sufficient Air Vehicles to support a wartime surge Operational Tempo (OPTEMPO).

5. Meetings of the TUAV System Safety Working Group (SSWG) occur periodically as needed. The SSWG supports the Program Manager's system safety program and the hazard risk management process. It is co-chaired by the TUAV Project Manager's Office and the U.S. Army AMCOM Safety Office. System Safety Working Group primary members and participants include AMCOM Engineering Directorate, AAI, TRADOC System Manager, and the U.S. Army Safety Center. Hazards are identified, assessed and tracked to resolution by the



SSWG and are documented in the Hazard Tracking Log (HTL). The HTL is updated in conjunction with SSWG and risk management actions. The risk management process and HTL have been in place throughout the TUAV program. A list of hazards currently being investigated and tracked, and their status is available from the TUAV PM HTL.

6. The following eight hazards remain open as of the writing of this Safety Suitability Statement:

(a) Hazard Tracking Log item 002 – Electrical shock from inside power panel when accessing inside for maintenance. Energized power terminals inside power panel were not covered with a non-conducting cover as required by the National Electric Code (NEC). The system has now been modified so that the power panel is covered in accordance with the NEC. Therefore, this hazard is being closed, with zero residual risk.

(b) Hazard Tracking Log item 020 – Explosion and fire hazard created by Universal Power Supply (UPS) batteries venting hydrogen gas into the Ground Control Station (GCS). The UPS batteries are sealed lead-acid batteries. AAI has an action to determine if these batteries are capable of venting hydrogen gas. If not, this hazard will be administratively closed. If so, a System Safety Risk Assessment will be prepared and staffed through the appropriate risk decision authority.

(c) Hazard Tracking Log item 039 – TUAV Launcher cylinder bypass and main system bypass controls are not labeled. Confusion of control identity or position may result in unintended control commands and possibly an accident. Control labels have been applied. When verified that all control labels have been applied, this hazard will be closed, with zero residual risk.

(d) Hazard Tracking Log item 066 – Possible exposure to RF energy from the Tactical Automatic Landing System (TALS) Tracking Subsystem (TS), i.e. the land-based interrogator, during operation or maintenance may result in personnel injury. AAI has an action to determine if the TALS TS radome precludes exposure to hazardous RF emissions from the TALS TS. If so, this hazard will be closed with zero residual risk. If not, an SSRA will be prepared and staffed through the appropriate risk decision authority.

(e) Hazard Tracking Log item 067 – Possible exposure to RF energy from the TALS Airborne Subsystem (AS), i.e. the transponder in the Air Vehicle, during operation or maintenance may result in personnel injury. AAI has an action to determine if the TALS AS radome precludes exposure to hazardous RF emissions from the TALS AS. If so, this hazard will be closed with zero residual risk. If not, an SSRA will be prepared and staffed through the appropriate risk decision authority.

AMSAM-SF-A

13 Jun 02

SUBJECT: Tactical Unmanned Aerial Vehicle (TUAV) System Safety Suitability Statement

(f) Hazard Tracking Log item 083 – The 10BaseT/10Base2 media converter power supply bricks, located behind the center display panel, are not secured to the plugmold. If the power supply inadvertently becomes unplugged, equipment damage or mission failure may result. Efforts are underway to modify the system to secure the power supply connection to the plugmold. When this modification is complete and verified, this hazard will be closed, with zero residual risk.

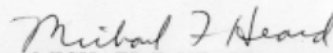
(g) Hazard Tracking Log item 088 – The weights of some Remote Video Terminal (RVT) components exceed the fifth percentile female weight lifting limits of MIL-STD-1472. These components may not be labeled with the appropriate warning labels, and user's manuals may not contain the appropriate warnings. Personnel injury may result. Appropriate warnings, and training and procedures will be verified prior to closing this hazard, with zero residual risk.

(h) Hazard Tracking Log item 097 – High pressure nitrogen plumbing on the TUAV Launcher is subject to Foreign Object Damage (FOD), resulting in the potential for the nitrogen line to rupture, causing system damage and possible injury. A protective covering is being added to the nitrogen lines. When that is complete and verified, this hazard will be closed, with zero residual risk.

7. The AMCOM Aviation Systems Safety Division believes the RQ-7A, TUAV system is suitable for type classification and materiel release when used in accordance with applicable maintenance and operation manuals, and Milestone C approval is recommended. User acceptance of open hazards is required prior to materiel release.

8. This statement should not be used in lieu of the independent evaluator's statement. The TUAV user's representative is strongly encouraged to participate in TUAV System Safety Working Group meetings and the hazard risk management process.

9. The point of contact for this action is Mr. Ron Price, DSN 788-8636, commercial (256) 842-8636, email: [ron.price@redstone.army.mil](mailto:ron.price@redstone.army.mil).



MICHAEL F. HEARD

Acting Chief, Aviation Systems Safety Division

CF:

AMSRL-HR-MO (T. Cook)

SFAE-AV-UAV-LO (A. Grayson)

SFAE-AV-UAV-TM (T. Lamar)

## Hazardous Materials

PRODUCT	HAZMATS	STATUS/MITIGATION
Epoxy Resin and Hardener		Monitor: Use restricted to depot repair – no utilization at AVUM.
Antiseize 767 Thread Compound	Mineral Oil, Copper and Graphite	Closed: Not judged to be a hazard.
RTV 3145 Adhesive Sealant	Methyltrimethoxysilane and Trimethylated Silica	Closed: Not judged to be a hazard.
MOGAS		Monitor: Warning appears in WP 72 Prep AV for Flight Ops in TM 9-5895-681-10.
Nitrogen	Nitrogen	Open: AVUM maintenance does not involve nitrogen with LAU or payload.
Hydraulic Fluid		Open: No direction/identification provided to date.
Fire Suppressant		Open: No direction/identification provided to date.
Balancing Weights	Lead	Open: No direction/identification provided to date.
Batteries	Lead acid	Monitor: Warning appears in WP 72 Prep AV for WP 38 AV Battery Remove and Replace in TM 9-5895-681-10.

List of Hazardous Materials Used in UAV  
(Table 2-1 from Life-Cycle EA for Shadow TUAV, AMCOM 2002).

**APPENDIX F**  
**Environmental Site Work Plan Evaluation Checklist**

**Environmental Site Work Plan Evaluation Checklist**  
(Non-RI/FS/ROD)

<b>Site / Activity Information</b>			
Environmental Site Number: NA		Project Name or DPW Tracking #:DES # 1050-04 TA-3 UAV area project	
Name of Requestor:Joey Skinner		Contact for Additional Information: Name: Joey Skinner Office Symbol: AMSAM-RA-DPW-EN-AC Bldg. # or Area: - Joey.Skinner@redstone.army.mil Phone:955-8830	
Phone #: 955-8830			
A Project Work Plan is required to be submitted through DPW for an environmental evaluation. The Directorate of Environment and Safety may require other submittals before any job commences. Required Submittals if <b>CERCLA</b> Site is Affected: <input type="checkbox"/> - Key Personnel List - Project Manager, Safety Officer, etc. <input type="checkbox"/> - Project Safety and Health Plan <input type="checkbox"/> - Project Work Plan (attached) <input type="checkbox"/> - Other, Specify: <input checked="" type="checkbox"/> COPIES OF REQUIRED SUBMITTALS SHALL BE FORWARDED TO AMSAM-RA-DES-IR BEFORE JOB COMMENCES			
<b>Reviewer Certification / Recommendation</b>			
1. Based on my review of the data provided about the nature of the work to be performed this activity is: <input type="checkbox"/> - Approved, Project is not on an identified CERCLA site. <input checked="" type="checkbox"/> - Approved, contingent on the controls noted being implemented. <input type="checkbox"/> - Disapproved.			
2. Regulatory oversight concurrence <input type="checkbox"/> - is / <input checked="" type="checkbox"/> - is not - recommended by <input type="checkbox"/> - ADEM, <input type="checkbox"/> - EPA.			
Primary Reviewer Signature (Dir. of Environment and Safety (DES)) John I. Blandamer Garrison/DES/Installation Restoration Division, 842-2836		Date 12 Apr 04	
Secondary Reviewer Signature (Dir. of Environment and Safety (DES)) John I. Blandamer, Garrison/DES/Installation Restoration Division		Date 12 Apr 04	
<b>Regulatory Agency Review</b>			
ADEM Signature:  Date:	<input type="checkbox"/> - Concur <input type="checkbox"/> - Do Not Concur <input type="checkbox"/> - Conditional Concurrence (See below)	EPA Signature:  Date:	<input type="checkbox"/> - Concur <input type="checkbox"/> - Do Not Concur <input type="checkbox"/> - Conditional Concurrence (See below)
Additional Control Requirements	ADEM	EPA	
<b>Special Instructions / Restrictions / Notes</b>			
This work is within the boundaries of RSA-050 (CERCLA) and RSA-74 (RCRA). Portions of the work involve surface and subsurface work while other portions involve tree trimming only. This area is a former aerial bombing mat that used incendiary bombs, smoke munitions, and dummy ordnance filled with simulants. No CWA use areas. Traditional UXO only. Recommend that Garrison Safety review for any required UXO construction support of subsurface work. DES-IR should review for RCRA site clearance. No chemical contamination is anticipated.			



**APPENDIX G**  
**Public Notice**

April 2004

FINDING OF NO SIGNIFICANT  
IMPACT (FNSI)  
ENVIRONMENTAL ASSESS-  
MENT FOR THE TRAINING,  
TESTING, AND OPERATION  
OF UNMANNED AERIAL VEHIC-  
LES  
AT REDSTONE ARSENAL, AL-  
ABAMA

The Army proposes to conduct training, testing, and flight operations of unmanned aerial vehicles (UAV) at Redstone Arsenal, Alabama. The environmental analysis addresses two alternatives, the proposed action and the no-action alternative.

**Proposed Action:** The proposed action includes training, testing, and operations of unmanned aerial vehicles at Redstone Arsenal. The location for ground operations is on Test Area 3 and will include the construction of a new airstrip and a new building. Test Area 3 was determined to be the most suitable location on the installation that would accommodate the proposed training and testing operations, as well as allowing future expansion of the UAV operations if needed. The maximum potential disturbance area encompasses approximately 30 acres, which includes the construction areas needed for earth-moving activities, the proposed building location, and the tree removal areas. The proposed construction will occur in two phases. The first phase will consist of a 200 foot long asphalt runway with 200 foot grassed run-out areas on each end. The second phase will consist of the addition of 1100 feet of asphalt runway to the initial runway for a 1300 foot total length and will occur at a later date. The new building will also be constructed in the future and consists of approximately 30,000 ft<sup>2</sup>.

The proposed action will provide training to U.S. military and Department of Defense (DoD) civilians in support of national security concerns in addition to allowing flight operations and testing of UAVs to be conducted at the installation. Maintenance operations for UAV will be conducted on-site. The new building will be used for administration, vehicle storage, and equipment storage. In the future, the airstrip will be used for testing operations of UAV. The FAA-approved airspace for UAV flight training and testing includes RSA airspace and an area south of the installation that up to five nautical miles from the southern installation boundary. UAV flight operations are not allowed over the Huntsville Metropolitan Area. Site locations further north on the installation will not allow the UAVs to remain in RSA airspace during take-off and landing. The training and operations at the RSA airfield would not be safe for the operators, personnel, and student trainees, and would disrupt the normal operation of the airfield.

**No-Action Alternative:** Under the no-action alternative, training and testing activities, as well as the construction of the new airstrip and building would not occur at RSA. The current facilities at RSA are inadequate to conduct regular training and testing of UAV. The immediate need for the training of the National Guard units would not be met due to logistical difficulties involved in transfer of the units and equipment to alternate locations.

**Environmental Effects:** Eleven broad environmental components or resources were considered to provide a context for understanding the potential effects of the proposed action and to provide a basis for assessing the significance of potential impacts. The areas of environmental consideration were air quality, health and safety, biological resources, cultural resources, hazardous materials and waste, geology and soils, transportation, infrastructure, land use, noise, socioeconomic, and water resources. Cumulative impacts of the proposed action were also analyzed.

No impacts were identified for land use and socioeconomic components. No significant impacts to the other environmental resources were found and anticipated impacts are mitigable. Best management practices will be used to minimize erosion. Appropriate spill prevention measures, including secondary containment for fuels and vehicle lubricants, drip pans placed under generators and stationary vehicles, and spill mitigation kits will be used during operations. On-site unexploded ordnance support will be required during construction. A crash plan will be developed for operations. Hearing Protection devices will be required for all operators. UAV launches will not occur directly over Martin Road. No significant cumulative impacts were identified under the alternatives.

CONCLUSION

The Directorate of Environment and Safety (DES) has prepared an EA that addresses the proposed action and evaluates the environmental impacts of the alternatives considered. Based on the EA for the training, testing, and flight operations of UAV at Redstone Arsenal, Alabama, April 2004, there would be no significant environmental impacts associated with this project that would require the preparation of an Environmental Impact Statement.

Should you wish to review the proponent's Environmental Assessment for the Training, Testing, and Flight Operations of UAV at Redstone Arsenal, Alabama, or comment on this action, you may contact Ms. Pam Rogers, 256-876-4162, Commander, U.S. Army Garrison-Redstone, ATTN: AM-SAM-IN (Ms. Pam Rogers), Redstone Arsenal, Alabama, 35898-5020, within thirty days from the date of this publication.

April 18, 2004

E10 The Huntsville Times, Sunday, April 18, 2004

**APPENDIX H**  
**Concurrence Letters**

**Phillips, Bryan W Contractor/AAC**

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**From:** Miller.Gerald@epamail.epa.gov  
**Sent:** Monday, April 26, 2004 1:33 PM  
**To:** Phillips, Bryan W Contractor/AAC  
**Subject:** Re: FW: request for review of two Environmental Assessments at Redstone Arsenal

Dr. Gerald Miller  
Senior Ecologist  
NEPA Program Office  
U.S. EPA, Region 4  
(404) 562-9626  
Miller.Gerald@EPA.GOV

Examined both EAs and determined that they were procedurally adequate. Environmental-wise, EPA would have no significant objections to construction of the noted facilities.



IN REPLY REFER TO:

04-0834

## United States Department of the Interior

FISH AND WILDLIFE SERVICE  
P.O. Drawer 1190  
Daphne, Alabama 36526

May 14, 2004

Mr. Brian Phillips  
U.S. Army Garrison - Redstone Arsenal  
Directorate of Environment and Safety  
4488 Martin Rd. (AMSAM-RA-DES)  
Redstone Arsenal, AL 35898-5000

Dear Mr. Phillips:

We are responding to your electronic mail, sent April 2004, requesting review of the Environmental Assessment (EA) for the Unmanned Aerial Vehicle Training Facility Construction and Operation at Redstone Arsenal, Madison County, Alabama. We have reviewed the information and are providing the following comments in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.) and the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The Service concurs with the assessment that the proposed training and construction project referred to in the EA will not likely affect listed species. Therefore, no further endangered species consultation will be required unless: 1) the identified action is subsequently modified in a manner that causes an effect on a listed species or designated Critical Habitat; 2) new information reveals the identified action may affect federally protected species or designated Critical Habitat in a manner or to an extent not previously considered; or 3) a new species is listed or a Critical Habitat is designated under the Endangered Species Act that may be affected by the identified action.

If you have any questions or need additional information, please contact Mr. Bruce Porter at (251)441-5864 or email [bruce\\_porter@fws.gov](mailto:bruce_porter@fws.gov).

Sincerely,

Larry E. Goldman  
Field Supervisor

PHONE: 251-441-5181

[www.fws.gov](http://www.fws.gov)  
SHIPPING ADDRESS: 1208-B Main Street, Daphne, AL 36526

FAX: 251-441-6222



STATE OF ALABAMA  
ALABAMA HISTORICAL COMMISSION  
468 SOUTH PERRY STREET  
MONTGOMERY, ALABAMA 36130-0900

LEE H. WARNER  
EXECUTIVE DIRECTOR

TEL: 334-242-3184  
FAX: 334-240-3477

April 3, 2000

Carolene Wu  
U.S. Army Aviation and Missile Command  
Directorate of Environmental Management and Planning  
Redstone Arsenal, Alabama 35898

Re: AHC 00-0752  
Phase I Cultural Resource Assessment  
2023 Hectares on Redstone Arsenal  
Madison County, Alabama

Dear Ms. Wu:

Upon review of the cultural resource assessment conducted by Alexander Archaeological Consultants, the Alabama Historical Commission has determined that the overall report is very well done. We agree with the author that forty-five of the sites located are not eligible for the National Register. We also agree with the author that there are thirty-eight sites which are potentially eligible for the National Register. These should be avoided. If avoidance is not feasible, Phase II testing proposals should be developed and forwarded to our office for review and approval. Regarding site 1 Ma 903, we request clarification as to its National Register eligibility status. On page xii, paragraph 2, the report states that this site is potentially eligible. On page 244, the last line indicates that the authors recommend this site as ineligible. Finally, on page 313, first paragraph, the site is listed as potentially eligible. Please advise our office as to which is correct and we recommend the report be appended to reflect this.

We appreciate your efforts on this project. Should you have any questions or comments, please contact Stacye Hathorn or Greg Rhinehart of our office and include the AHC tracking number referenced above.

Sincerely,

Thomas O. Maher, Ph.D.  
State Archaeologist

for: Elizabeth Ann Brown  
Deputy State Historic Preservation Officer

EAB/TOM/SGH/GCR

cc: L. Alexander

THE STATE HISTORIC PRESERVATION OFFICE  
[www.preserveala.org](http://www.preserveala.org)